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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 292

SURFACE WATER SUPPLY OF THE UNITED STATES

1910

PART XII. NORTH PACIFIC COAST

PREPARED UNDER THE DIRECTION OF M. O. LEIGHTON

BY

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AND G. C. STEVENS

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SURFACE WATER SUPPLY OF THE NORTH PACIFIC COAST, 1910.

By F. F. Henshaw, E. C. La Rue, and G. C. Stevens.

INTRODUCTION.

AUTHORITY FOR INVESTIGATIONS.

This volume contains results of measurements of the flow of certain streams in the United States. The work was performed by the United States Geological Survey, either independently or in cooperation with private or State organizations. The organic law of the Geological Survey (Stat. L., vol. 20, p. 394) contains the following paragraph:

> *Provided*, That this officer [the Director] shall have the direction of the geological survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

As water is the most abundant and most valuable of the minerals, the investigation of water resources is authorized under the provision for examining mineral resources. The work has been supported since the fiscal year ending June 30, 1895, by appropriations in successive sundry civil bills passed by Congress under the following item:

> For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

The various appropriations that have been made for this purpose are as follows:

Annual appropriations for the fiscal year ending June 30—

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911	150,000

SCOPE OF INVESTIGATIONS.

These investigations are not complete nor are they inclusive of all the streams that might purposefully be studied. The scope of the work is limited by the appropriations available. The field covered is the widest and the character of the work is believed to be the best possible under the controlling conditions. The work would undoubtedly have greater scientific importance and ultimately be of more practical value if the money now expended for wide areas were concentrated on a few small drainage basins; but such a course is impossible because general appropriations made by Congress are applicable to all parts of the country. Each part demands its proportionate share of the benefits.

It is essential that records of stream flow shall be kept during a period of years long enough to determine within reasonable limits the entire range of flow from the absolute maximum to the absolute minimum. The length of such a period manifestly differs for different streams. Experience has shown that the records for some streams should cover 5 to 10 years, and those for other streams 20 years or even more, the limit being determined by the relative importance of the stream and the interdependence of the results with other long-time records on adjacent streams.

In the performance of this work an effort is made to reach the highest degree of precision possible with a rational expenditure of time and a judicious expenditure of a small amount of money. In all engineering work there is a point beyond which refinement is needless and wasteful, and this statement applies with especial force to stream-flow measurements. It is confidently believed that the stream-flow data presented in the publications of the Survey are in general sufficiently accurate for all practical purposes. Many of the records are, however, of insufficient length, owing to the unforeseen reduction of appropriations and consequent abandonment of stations. All persons are cautioned to exercise the greatest care in using such incomplete records.

Records have been obtained at nearly 2,000 different points in the United States. The surface water supply of small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in Hawaii has also been investigated. During 1910 regular gaging stations were maintained by the Survey and cooperating organizations at about 1,100 points in the United States, and many discharge measurements were made at other points. Data were also obtained in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country, and will be made available in the regular surface water-supply papers and in special papers from time to time.

PUBLICATIONS.

The data on stream flow collected by the United States Geological Survey have appeared in the annual reports, bulletins, and water-supply papers. Owing to natural processes of evolution and to changes in governmental requirements the character of the work and the territory covered by these different publications have varied greatly. For the purpose of uniformity in the presentation of reports a general plan has been agreed upon by the United States Reclamation Service, the United States Forest Service, the United States Weather Bureau, and the United States Geological Survey, according to which the area of the United States has been divided into twelve parts, whose boundaries coincide with certain natural drainage lines. The areas so described are indicated by the following list of papers on surface water supply for 1910. The dividing line between the north Atlantic and south Atlantic drainage areas lies between York and James rivers.

Papers on surface water supply of the United States, 1910.

Part.	No.	Title.
I	281	North Atlantic coast.
II	282	South Atlantic coast and eastern Gulf of Mexico.
III	283	Ohio River basin.
IV	284	St. Lawrence River basin.
V	285	Upper Mississippi River and Hudson Bay basins.
VI	286	Missouri River basin.
VII	287	Lower Mississippi River basin.
VIII	288	Western Gulf of Mexico.
IX	289	Colorado River basin.
X	290	Great Basin.
XI	291	Pacific coast in California.
XII	292	North Pacific coast.

The following table gives the character of data regarding stream flow at regular stations to be found in the various publications of the United States Geological Survey, exclusive of special papers:

Stream-flow data in reports of the United States Geological Survey.

[A=Annual Report; B=Bulletin; WS=Water-Supply Paper.]

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge	1884 to Sept. 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
WS 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for earlier years).	1895 and 1896.
WS 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.

Stream-flow data in reports of the United States Geological Survey—Continued.

Report.	Character of data.	Year.
WS 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
WS 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
WS 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
WS 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
WS 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
WS 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
WS 75	Monthly discharge	1901.
WS 82 to 85	Complete data	1902.
WS 97 to 100	do	1903.
WS 124 to 135	do	1904.
WS 165 to 178	do	1905.
WS 201 to 214	Complete data, except descriptions	1906.
WS 241 to 252	Complete data	1907–8.
WS 261 to 272	do	1909.
WS 281 to 292	do	1910.

NOTE.—No data regarding stream flow are given in the fifteenth and seventeenth annual reports.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing records prior to 1904 has been published in Water-Supply Paper 119.

The first table which follows gives, by years and drainage basins, the numbers of the papers on surface water supply published from 1899 to 1910. Wherever the data for a drainage basin appear in two papers the number of one is placed in parentheses and the portion of the basin covered by that paper is indicated in the second table. For example, in 1904 the data for Missouri River were published in Water-Supply Papers 130 and 131, and the portion of the records contained in Water-Supply Paper 131, as indicated by the second table, is that relating to Platte and Kansas rivers.

Numbers of water-supply papers containing results of stream measurements, 1899–1910.

	1899 [a]	1900 [b]	1901	1902	1903
Atlantic coast and eastern Gulf of Mexico:					
New England rivers	35	47	65, 75	82	97
Hudson River to Delaware River, inclusive	35	47, (48)	65, 75	82	97
Susquehanna River to York River, inclusive	35	48	65, 75	82	97
James River to Yadkin River, inclusive	(35), 36	48	65, 75	(82), 83	(97), 98
Santee River to Pearl River, inclusive	36	48	65, 75	83	98
St. Lawrence River	36	49	65, 75	(82), 83	97
Hudson Bay	.....	.....	66, 75	85	100
Mississippi River:					
Ohio River	36	48, (49)	65, 75	83	98
Upper Mississippi River	36	49	65, 75	83	98, (99)
Missouri River	(36), 37	49, (50)	66, 75	84	99
Lower Mississippi River	37	50	(65), 66, 75	(83), 84	(98), 99
Western Gulf of Mexico	37	50	66, 75	84	99
Pacific coast and Great Basin:					
Colorado River	(37), 38	50	66, 75	85	100
Great Basin	38, (39)	51	66, 75	85	100
South Pacific coast to Klamath River, inclusive	(38), 39	51	66, 75	85	100
North Pacific coast	38	51	66, 75	85	100

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39.
[b] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52.

Numbers of water-supply papers containing results of stream measurements, 1899–1910—Continued.

	1904	1905	1906	1907	1908	1909
Atlantic coast and eastern Gulf of Mexico:						
New England rivers	124	165	201	241	261	281
Hudson River to Delaware River, inclusive	125	166	202	241	261	281
Susquehanna River to York River, inclusive	126	167	203	241	261	281
James River to Yadkin River, inclusive	126	167	203	242	262	282
Santee River to Pearl River, inclusive	127	168	204	242	262	282
St. Lawrence River	129	170	206	244	264	284
Hudson Bay	130	171	207	245	265	285
Mississippi River:						
Ohio River	128	169	205	243	263	283
Upper Mississippi River	128, (130)	171	207	245	265	285
Missouri River	130, (131)	172	208	246	266	286
Lower Mississippi River	(128) 131	(169), 173	(205), 209	247	267	287
Western Gulf of Mexico	132	174	210	248	268	288
Pacific coast and Great Basin:						
Colorado River	133, (134)	175, (177)	211, (213)	249, (251)	269, (271)	289
Great Basin	133, (134)	176, (177)	212, (213)	250, (251)	270, (271)	290
South Pacific coast to Klamath River, inclusive	134	177	213	251	271	291
North Pacific coast	135	(177), 178	214	252	272	292

Numbers of water-supply papers containing data covering portions of drainage basins.

No.	River basin.	Tributaries included.
35	James	
36	Missouri	Gallatin.
37	Colorado	Green, Gunnison, Grand above junction with Gunnison.
38	Sacramento	Except Kings and Kern.
39	Great Basin	Mohave.
48	Delaware	Wissahickon and Schuylkill.
49	Ohio	Scioto.
50	Missouri	Loup and Platte near Columbus, Nebr. All tributaries below junction with Platte.
65	Lower Mississippi	Yazoo.
82	James	
	St. Lawrence	Lake Ontario, tributaries to St. Lawrence River proper.
83	Lower Mississippi	Yazoo.
97	James	
98	Lower Mississippi	Do.
99	Upper Mississippi	Tributaries from the west.
128	Lower Mississippi	Yazoo.
130	Upper Mississippi	Tributaries from the west.
131	Missouri	Platte, Kans.
134	Colorado	Data near Yuma, Ariz., repeated.
	Great Basin	Susan, Owens, Mohave.
169	Lower Mississippi	Yazoo.
177	Colorado	Below junction with Gila.
	Great Basin	Susan repeated, Owens, Mohave.
	North Pacific coast	Rogue, Umpqua, Siletz.
205	Lower Mississippi	Yazoo, Homochitto.
213	Colorado	Data at Hardyville repeated; at Yuma, Salton Sea.
	Great Basin	Owens, Mohave.
251	Colorado	Yuma and Salton Sea stations repeated.
271	Great Basin	Owens River basin.

The order of treatment of stations in any basin in these papers is downstream. The main stem of any river is determined by measure ing or estimating the drainage area; that is, the headwater stream having the largest drainage area is considered the continuation of the main stream, and local changes in name and lake surface are disregarded. Records for all stations from the source to the mouth of the main stem of the river are presented first, and records for the tribu-

taries in regular order from source to mouth follow, all records in each tributary basin being given before those of the next basin below.

The exceptions to this rule occur in the records for Mississippi River, which are given in four parts, as indicated above, and in the records for large lakes, where it is simpler to take up the streams in regular order around the rim of the lake than to cross back and forth over the lake surface.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated woth a certain class of work. These terms may be divided into two groups—(1) those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. The units used in this series of reports are second-feet, second-feet per square mile, and run-off in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and is the unit for the rate of discharge of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the following table of equivalents.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of March 23, 1901).

1 second-foot equals 38.4 Colorado miner's inches.

1 second-foot equals 40 Arizona miner's inches.

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot equals 6.23 British imperial gallons per second.

1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
1 second-foot for one 31-day month equals 61.49 acre-feet.
100 California miner's inches equals 18.7 United States gallons per second.
100 California miner's inches equals 96.0 Colorado miner's inches.
100 California miner's inches for one day equals 4.96 acre-feet.
100 Colorado miner's inches equals 2.60 second-feet.
100 Colorado miner's inches equals 19.5 United States gallons per second.
100 Colorado miner's inches equals 104 California miner's inches.
100 Colorado miner's inches for one day equals 5.17 acre-feet.
100 United States gallons per minute equals 0.223 second-foot.
100 United States gallons per minute for one day equals 0.442 acre-foot.
1,000,000 United States gallons per day equals 1.55 second-feet.
1,000,000 United States gallons equals 3.07 acre-foot.
1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-feet.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
$1\frac{1}{3}$ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

EXPLANATION OF DATA.

For each drainage basin there is given a brief general description covering such items as area, source, tributaries, topography, geology, forestation, rainfall, irrigation, storage, power, and other interesting or important facts.

For each regular current-meter gaging station the following data, so far as available, are given: Description of station, list of discharge measurements, table of daily gage heights, table of daily discharges, table of monthly and yearly discharges, and run-off. For stations located at weirs or dams the gage height table is omitted.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy and reliability of the data.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, width and area of cross section, gage height, and discharge in second-feet.

The table of daily gage heights records the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. At most stations the gage is read in the morning and in the evening. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general the zero is located somewhat below the lowest known flow, so that negative readings shall not occur.

The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

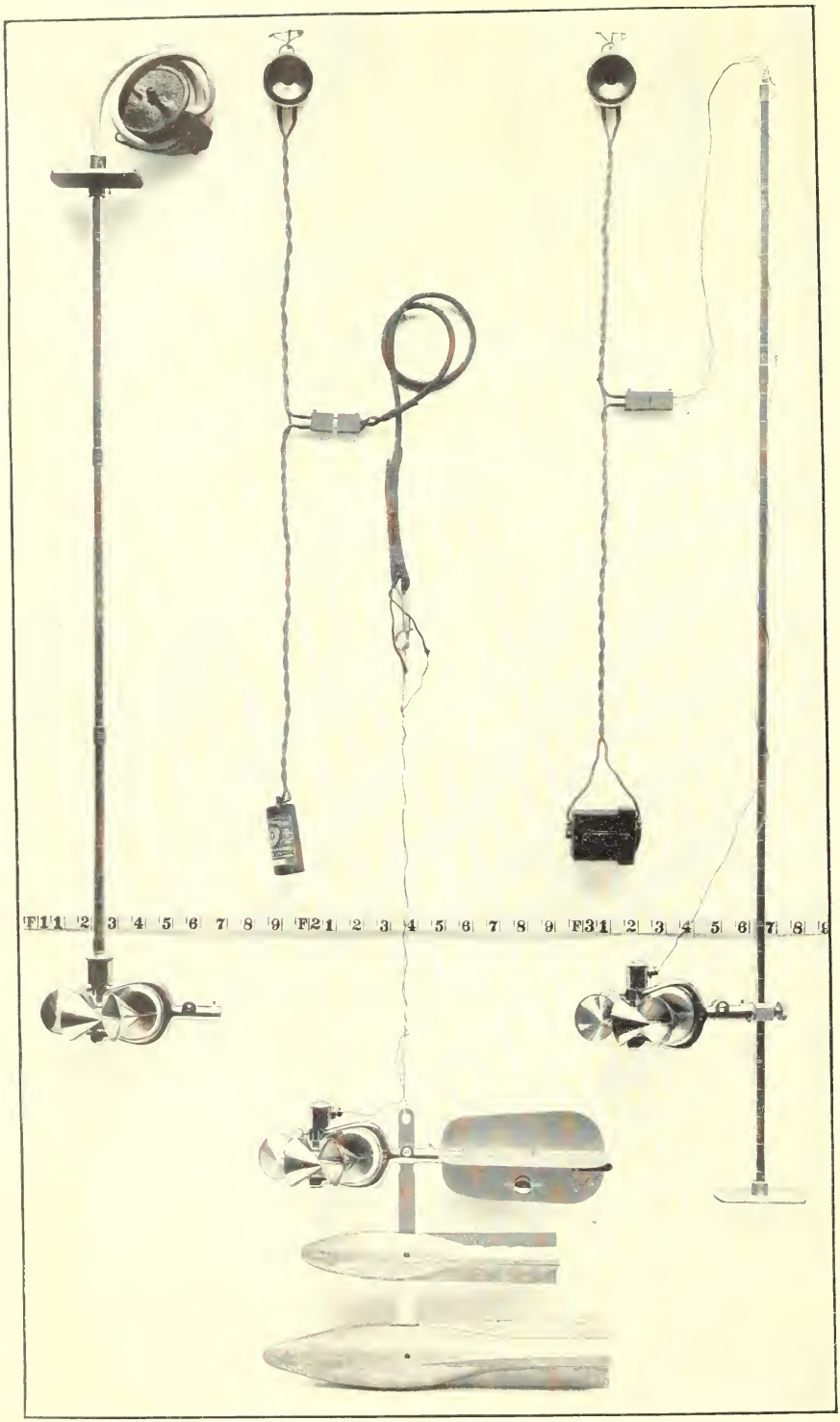
The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. It is not published in this report, but can be determined from the daily gage heights and daily discharges for the purpose of verifying the published results as follows:

First plot the discharge measurements for the current and earlier years on cross-section paper, with gage heights in feet as ordinates and discharge in second-feet as abscissas. Then tabulate a number of gage heights taken from the daily gage-height table for the complete range of stage given and the corresponding discharges for the days selected from the daily discharge table and plot the values

A. FOR BRIDGE MEASUREMENT.

B. FOR WADING MEASUREMENT.

TYPICAL GAGING STATIONS.



SMALL PRICE CURRENT METERS.

on cross-section paper. The last points plotted will define the rating curve used and will lie among the plotted discharge measurements. After drawing the rating curve, a table can be developed by scaling off the discharge in second-feet for each tenth foot of gage height. These values should be so adjusted that the first differences shall always be increasing or constant, except for known backwater periods.

The table of daily discharges gives the discharges in second-feet corresponding to the observed gage heights as determined from the rating tables.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns, which are defined on page 12, are based.

The field methods used in the collection of the data presented in this series of reports are described in the introductory sections of Water-Supply Papers 261 to 272, inclusive, "Surface water supply of the United States, 1909." Plates I and III, *A*, show typical gaging stations, indicating the method of suspending the current meter; Plate II shows the various types of current meters [1] used in the work.

ACCURACY AND RELIABILITY OF FIELD DATA AND COMPARATIVE RESULTS.

The accuracy of stream-flow data depends primarily on the natural conditions at the gaging station and on the methods and care with which the data are collected. Errors of the first group depend on the degree of permanency of channel and of permanency of the relation between discharge and stage.

Errors of the second class are due, first, to errors in observation of stage; second, to errors in measurements of flow; and, third, to errors due to misinterpretation of stage and flow data.

Practically all discharge measurements made under fair conditions are well within 5 per cent of the true discharge at the time of observation. Inasmuch as the errors of meter measurements are largely compensating, the mean rating curve, when well defined, is much more accurate than the individual measurements. Numerous experi-

[1] See Hoyt, J. C., and others, Use and care of the current meter as practiced by the United States Geological Survey; Trans. Am. Soc. Civil Eng., vol. 66, 1910, p. 70.

ments made to test the accuracy of current-meter work show that it compares very favorably with the results from standard weirs and, owing to simplicity of methods, usually gives results that are much more reliable than those from stations at dams, where the coefficient may be uncertain and conditions of flow are complicated.

The work is, of course, dependent on the reliability of the gage observers. With relatively few exceptions the observers perform their work honestly. The records are, however, closely watched, and the cause of any discrepancy is investigated. It is obvious that one gage reading a day does not always give the mean height for that day. As an almost invariable rule, however, errors from this source are compensating and virtually negligible in a period of one month, although a single day's reading may, when taken by itself, be considerably in error.

An effort is made to visit every station at least once each year for the purpose of making a measurement to determine the constancy of conditions of flow since the last measurement made in the preceding year, and also to check the elevation of the gage. On account of lack of funds or for other causes some stations were not visited during the current year. If conditions of flow have been reasonably permanent up to the time of the last preceding measurements, it is considered best to publish estimates of discharge based on the latest verified rating curve rather than to omit them altogether, although it should be distinctly understood that such records are at times subject to considerable error. This is also true, although to a less degree, of the period of records since the date of the last measurement of the current year. As a rule, the accuracy notes are based on the assumption that the rating curve used is strictly applicable to the current year.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily discharge tables, stating the probable accuracy of the rating tables used, and an accuracy column is inserted in the monthly discharge table. For the rating tables "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined" or "approximate," within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the mean rating curve.

The accuracy column in the monthly discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, and knowledge of local conditions. In this column A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

In general, the base data which are collected in the field each year by the Survey engineers are published, not only to comply with the law but also for the express purpose of giving to any engineer the opportunity of examining the computed results and of changing and adjusting them as may seem best to him. Although it is believed that the rating tables and computed monthly discharges are as good as the base data up to and including the current year will warrant, it should always be borne in mind that the additional data collected at each station from year to year nearly always throw new light on data already collected and published, and hence allow more or less improvement in the computed results of earlier years. It is therefore expected that the engineer who makes serious use of the figures presented in these papers will verify all ratings and make such adjustments for earlier years as may seem necessary. The work of compiling, studying, revising, and republishing data for different drainage basins for 5 or 10 year periods or more is carried on by the United States Geological Survey so far as the funds for such work are available.

The estimates in the table of monthly discharge are so arranged as to give only a general idea of the conditions of flow at the station, and it is not expected that they will be used for other than preliminary estimates.

The daily discharges are published to allow a more detailed study of the variation in flow and to determine the periods of deficient flow.

COOPERATIVE DATA.

Cooperative data of various kinds and data regarding the run-off at many stations maintained wholly by private funds are incorporated in the surface water-supply reports of the United States Geological Survey.

Many stations throughout the country are maintained for specific purposes by private parties who supply the records gratuitously to the United States Geological Survey for publication. When such records are furnished by responsible parties and appear to be reasonably accurate, they are verified, so far as possible, and estimated values of accuracy are given. Records clearly worthless or misleading are not published. As it is, however, impossible to completely verify all such records furnished—because of lack of funds or for other causes—they are published for what they are worth, as they are of value as a matter of record and afford at least approximate information regarding stream flow at the particular localities. The Survey does not, however, assume any responsibility for inaccuracies found in such records, although most of them are believed to be reasonably good.

COOPERATION AND ACKNOWLEDGMENTS.

CONDITIONS OF COOPERATIVE WORK.

During 1910 the work in Oregon, Washington, Idaho, and Montana has been done under cooperative agreements between the United States Geological Survey and the respective States.

In this work the State is the chief beneficiary, for its interest in obtaining a thorough and reliable knowledge of its water resources is paramount. At a very moderate cost for field work the State procures the services of men already trained in collecting and analyzing the fundamental data, and after the material has been gathered it is published without additional expense on the part of the State.

In general the cooperative agreements specify that the United States Geological Survey shall allot from its appropriation a sum equal to that appropriated from State funds; but to obtain results at all commensurate with public needs it has been necessary to expend a much larger sum.

The United States Reclamation Service, which is a heavy investor in the development of the water resources of the Western States, has been so handicapped by a lack of physical data that it has been forced to expend from its own fund considerable money for investigations of this kind. The United States Indian Office also in the development of projects for the benefit of the Indians, has found it necessary to make certain investigations of water supply. As these investigations are closely allied with the collection of statistics of rain and snowfall, the cooperation of the United States Weather Bureau has been enlisted to a small extent. The engineers of the Geological Survey in their regular field work are able to install and inspect some of the rainfall stations maintained by the Weather Bureau with but little loss of time. Under agreements with the Reclamation Service and with the Office of Indian Affairs the work has been performed under the direction of the engineers of the Geological Survey. Careful cost accounts have been kept of this work and repayments made to the Geological Survey of the amounts represented.

In order to determine the run-off from drainage areas in western forest reserves, cooperation has been entered into between the United States Geological Survey and the Forest Service. The gages are read, as a rule, by forest rangers or persons in the immediate vicinity of the stations if possible. Discharge measurements are made by engineers appointed and paid by the Forest Service. These engineers are instructed and their work is supervised by engineers of the United States Geological Survey. The final records are studied, ratings are made, and the results are published by the Geological Survey.

Cooperation with the States is effected under contracts which are made between the Director of the Federal Survey and the State engineers or other officials and are authorized by legislative acts

appropriating moneys. The State contracts are essentially of the same order, the principal provisions being substantially as follows:

1. The United States Geological Survey retains direct supervision of the field work and the preparation of the data for publication.

2. The Federal Survey retains possession of all material collected—field notes, maps, etc.—but this material is open at all times to inspection by the State officials, and if not satisfactory the agreements can be terminated at any time.

3. The salaries of gage observers and the salaries and traveling and field expenses of the engineers are divided between the two parties in some manner agreed upon, the accounts being rendered monthly in accordance with the regulations of the Federal Survey.

4. The streams and localities in which investigations shall be made are determined by conference between the State officials and the representatives of the United States Geological Survey.

5. The cost of publication is borne entirely by the Federal Survey.

COOPERATION IN OREGON.

In 1905 the Oregon Legislature passed an act providing for an annual appropriation of $2,500 for the investigation of water resources within the State, contingent upon an equal allotment by the United States Geological Survey for similar investigations.

During the calendar year 1910 the total expense for water-supply investigations from Government and State funds in Oregon was $9,417.77. The amount for this year, and also for 1909, was distributed among the several cooperating bureaus as follows:

Expenditures for hydrometric work in Oregon, calendar years 1909 and 1910.

	1910	1909
United States Geological Survey	$5,591.07	$2,558.59
United States Reclamation Service	985.58	3,289.95
Office of Indian Affairs	342.19	193.86
United States Weather Bureau	.....	66.02
Total Government funds	6,918.84	6,108.42
State of Oregon cooperative fund	2,498.93	2,498.24
Total spent in State	9,417.77	8,606.66

The cost of hydrographic work has been a subject of frequent inquiry. In this connection the following data will be of interest:

Cost of hydrometric work in Oregon, calendar years 1909 and 1910.

	1910	1909
Total expenditure for maintenance of river station and allied investigations	$9,039.32	$8,606.66
Total expenditure for land-examination work	$378.45	.....
Number of stations maintained	96	86
Cost per station	$94.00	$100.00
Number of stream gagings made	250	166
Cost per gaging	$36.00	$52.00

Distribution of expenditures.

	1910		1909	
	Amount.	Per cent.	Amount.	Per cent.
Field services	$3,847.80	41	$3,996.00	47
Office services	1,421.61	15	1,588.09	18
Traveling expenses	2,281.09	24	1,594.02	19
Supplies and equipment	847.21	9	356.29	4
Lost time (Sundays, holidays, etc.)	507.98	5	638.99	7
Rent and storage	233.75	3	262.20	3
General	278.33	3	171.07	2
	9,417.77	100	8,606.66	100

These expenditures did not take into account the expenses of the United States Forest Service for hydrometric work. That service maintained an engineer in the field during the last portion of 1910 for the purpose of making stream measurements within the Forest Reserves under the direction of the Geological Survey. No statement of these expenditures for 1910 have been obtained from the Forest Service, but it probably amounted to, approximately, $1,200 for the State of Oregon. This is one reason why the cost per gaging is so much lower for 1910 than for 1909, but this is partly due to the fact that only a limited number of measurements could be made in 1909 on account of lack of funds, while the most of the stations were discontinued with a view of interpreting the records by measurements secured later, which has in almost all cases been done.

COOPERATION IN WASHINGTON.

The legislature of 1909 passed an act containing the following section:

> In order to complete the topographic map of the State of Washington, and for the purpose of making more extensive stream measurements and otherwise investigating and determining the water supply of the State, there is hereby appropriated the sum of $30,000 for cooperation with those branches of the United States Geological Survey engaged in this work. This appropriation, however, shall be contingent upon and not become available unless the United States Government appropriates an equal amount to be expended for similar purposes within the State. The Board of Geological Survey is hereby authorized and directed to enter into such agreements with the Director of the United States Geological Survey as will insure that the said surveys and investigations be carried on in the most economical manner, and that the maps and data be available for the use of the public as quickly as possible.

The appropriation for $30,000 was for two years' work. The division of the amount between topographic surveys and water-supply investigations was left open to agreement. It was agreed that the sum of $10,000 should be expended for the former and $5,000 for the latter during the fiscal year 1910. In the State of Washington the Board of Geological Survey is made the cooperating agent.

In 1910 the work of making the river profiles was assigned to the topographic branch, and the work of the water resources branch in

connection with the power reports was confined to the studies of the possibilities of development and the investigation of the water supply. Of the $5,000 for water-supply investigation one-half was transferred to the topographic branch for the river surveys and the other half was allotted to the water resources branch for continuing its investigations.

The following tables give the cost of water-resources investigation for the State during 1909 and 1910, and the distribution of these expenses. The item "Power report" for 1909 includes the cost of making the surveys, while for 1910 it includes merely the special work done by the water resources branch in connection with the power reports.

Expenditures for hydrometric work in Washington, calendar years 1909 and 1910.

	1910	1909
United States Geological Survey	$5,228.92	$3,199.58
United States Reclamation Service	5,171.91	5,462.90
Office of Indian Affairs	909.25	471.27
Total Government funds	11,310.08	9,133.75
State of Washington cooperative fund	2,432.41	4,143.79
Total	13,742.49	13,277.54

Cost of hydrometric work in Washington, calendar years 1909 and 1910.

	1910	1909
Total expenditure for maintenance of river stations and allied investigations	$13,226.14	$9,101.68
Power report	$516.35	$4,175.86
Number of stations maintained	108	85
Cost per station	$122.50	$107.00
Number of gagings made	552	508
Cost per gaging	$24	$18

Distribution of expenditures.

	1910		1909	
	Amount.	Per cent.	Amount.	Per cent.
Field service	$4,775.58	34.8	$5,207.22	40
Office services	3,134.04	22.8	2,326.17	17
Traveling expenses	3,091.19	22.6	3,096.63	23
Supplies and equipment	1,149.78	8.2	1,386.49	10
Lost time (Sundays, holidays, etc.)	780.60	5.7	946.11	7
Rent and storage	371.60	2.7	202.05	2
General	440.03	3.2	112.87	1
	13,742.49	100.0	13,277.54	100

These expenditures, as in the case of Oregon, do not include the cost of keeping one engineer in the field during the last half of the year, which was borne by the United States Forest Service, and which probably amounted to about $1,200.

COOPERATION IN IDAHO.

The State of Idaho, acting under authority given by the legislature of 1909 through its State land board, appropriated the sum of $2,000, contingent upon the expenditure by the United States of an equal amount, for the investigation of the water resources of the State.

On July 1, 1909, a contract was entered into between the State engineer, representing the State of Idaho, and the Director of the Geological Survey, representing the United States. This contract provided for the expenditure of $2,000 by each party during the 12 months from July 1, 1909, to June 30, 1910, for the purpose of making this investigation.

On July 1, 1910, the sum of $10,000 became available for the stream-measurement work within the State of Idaho for the fiscal year beginning on that date. One-half of this amount was furnished by the State land board of the State of Idaho and the other half by the Geological Survey. The 1909 contract was renewed in such a manner as to provide for the increased amount to be expended, no other change in its provisions being made.

Interbureau agreements have been reached whereby the greater part of the stream-measurement work for the Reclamation Service and for the Indian Service within the State of Idaho is carried on by the Geological Survey through its organized force, and the actual cost thereof refunded.

For the calendar year 1910 there has been expended in stream-measurement work within the State of Idaho from Government, State, and private funds a total amount of $15,652.31, distributed as follows:

Expenditures for hydrometric work, Idaho, calendar year 1910.

United States Geological Survey	$3,213.27
United States Reclamation Service	5,704.37
Office of Indian Affairs	650.73
United States Reclamation Service—special investigation connected with Minidoka power tests	372.21
Total Government funds	9,940.58
State of Idaho cooperative fund	5,575.48
From private cooperation	136.25
	15,652.31

Summary showing cost of hydrometric work in Idaho, calendar year 1910.

Total expenditures for maintenance of river stations and allied investigations (Minidoka power test eliminated)	$15,280.10
Number of stations maintained	46
Cost per station	332.18
Number of stream gagings made	630
Cost per gaging	$24.25

Distribution of expenditures.

	Per cent.
Field services	39
Travel	29
Office services	14
Supplies and equipment	10
Lost time (Sundays, holidays, etc.)	5
Rent and storage	2
General	1

The large average cost per station given in the above table is due, partially, to the large number of new stations which were installed during the year, and partially to the large amount of work done on a number of individual stations in connection with the Snake River stored-water investigation. This, however, has tended to reduce the average cost per gaging somewhat, as at a number of the gaging stations hydrographers stationed continuously on the ground made from one to four or five gagings daily for a period of one or two months.

COOPERATIVE WORK IN COLUMBIA RIVER DRAINAGE BASIN, MONTANA.

The work in the Columbia River drainage basin in Montana is carried on largely in cooperation with the United States Reclamation Service. The work is confined entirely to streams in connection with reclamation projects on Flathead River and its tributaries. With the exception of a few observers paid by the Geological Survey and the State of Montana, the entire cost of the work is borne by the Reclamation Service.

The following is a statement of the amounts and a distribution of the expenditures:

Expenditures for hydrometric work in Columbia River drainage basin, Montana, calendar year 1910.

United States Geological Survey	$634.00
United States Reclamation Service	1,113.82
Total Government funds	1,747.82
Number of stations maintained	23
Cost per station	$75.94
Number of gagings made	80
Cost per gaging	$21.85

Distribution of expenditures.

	Per cent.
Field service	57.3
Office services	12.2
Traveling expenses	19.9
Supplies and equipment	5.8
Lost time (Sundays, holidays, etc.)	3.0
General	1.8

SPECIAL ACKNOWLEDGMENTS.

Special acknowledgments are due to John H. Lewis, State engineer of Oregon; to Henry Landes, State geologist of Washington; and to D. G. Martin, State engineer of Idaho, for the very efficient manner in which they represented their respective States in the cooperative investigations.

Acknowledgments are due to the engineers and employees of the United States Reclamation Service, the United States Forest Service, and of the United States Office of Indian Affairs for assistance, suggestions, and the freest use of data gathered exclusively for them and for which they have paid. Acknowledgments are also due to the Corps of Engineers, United States Army, and the officers of the United States Weather Bureau for hydrographic and climatologic data. A number of irrigation and power companies, several railroad companies, and many individuals have cooperated in the maintenance of many stations and have cheerfully furnished much valuable information; for assistance and suggestions thus rendered acknowledgment is hereby made.

DIVISION OF WORK.

The field data in the Columbia River Basin in Oregon and Washington, the Puget Sound drainage area, and the Pacific Ocean drainage area in Oregon were collected by J. C. Stevens, and F. F. Henshaw, district engineers, H. D. McGlashan, L. R. Allen, E. S. Fuller, Howard Kimble, R. W. Davenport, F. B. Storey, and John Dubuis.

The ratings, special estimates, analyses, computations, and final preparation of the completed data of Oregon and Washington for publication were made under the direction of F. F. Henshaw, district engineer, by E. S. Fuller, G. L. Parker, Howard Kimble, F. B. Storey R. W. Davenport, and Charles Leidl.

The field data for the Snake River drainage area in Idaho have been collected by E. C. La Rue, district engineer, G. C. Baldwin, O. W. Hartwell, Lynn Crandall, A. B. Purton, E. A. Porter, and H. L. Stoner. The ratings, special estimates, and analyses of computed data were made by F. F. Henshaw, O. W. Hartwell, G. C. Baldwin, G. C. Stevens, R. C. Rice, and H. D. Padgett. The computations and preparation of completed data for publication were made under the direction of G. C. Stevens, assistant engineer, by H. D. Padgett, J. G. Mathers, J. J. Phelan, M. E. McChristie, M. I. Walters, A. H. Tuttle, and H. J. Dean.

The field data for the Clark Fork drainage area in Montana have been collected by W. A. Lamb, district engineer, Raymond Richards, B. E. Jones, J. C. Beebe, and M. E. McChristie. The ratings, special estimates, and analyses of completed data were made by W. A. Lamb, and Raymond Richards. The computations were made and the

completed data prepared for publication under the direction of Raymond Richards, assistant engineer, by R. C. Rice, H. D. Padgett, J. G. Mathers, and M. I. Walters.

The manuscript has been edited by Mrs. B. D. Wood.

ROGUE RIVER BASIN.

GENERAL FEATURES.

Rogue River drains an area in the southwestern corner of the State of Oregon, including the extreme western part of Klamath County and portions of Jackson, Josephine, and Curry counties. On its north side are the Rogue River Mountains, on the east are the Cascades, and in southern part of the area is a spur of the Siskiyou Mountains. In all, the basin comprises 5,080 square miles.

The river is formed by three principal forks—the North, Middle, and South—which rise among the peaks of the Cascade Range and unite near Prospect, in Jackson County. From this point Rogue River winds in a general westerly direction to the ocean, which it enters near the town of Gold Beach, in Curry County. In the lower half of its course the stream hugs closely the base of the Rogue River Range. Its principal tributaries are shown by the following table:

Principal tributaries of Rogue River.

From the north and west.	From the east and south—Continued.
North Fork.	Big Butte Creek (drainage area, 268 square miles).
Elk Creek.	Little Butte Creek (drainage area, 361 square miles).
Stewarts Creek.	Bear Creek (Stewart Creek) (drainage area, 380 square miles).
Evans Creek.	Applegate Creek (drainage area, 606 square miles).
Leland Creek.	Illinois River.
From the east and south.	
Middle Fork.	
South Fork.	

The North Fork, or main stream, derives its water from springs, probably supplied from Crater Lake, which lies near the center of Crater Lake National Park, at an elevation of 6,240 feet above sea level. This lake occupies the crater of an ancient volcanic mountain, to which the name Mount Mazama has been applied. The lake has no visible outlet.[1] The walls inclosing it are made up of alternating sheets of lava, dipping away from the lake practically in all directions. They are porous enough to afford passage for considerable water. Springs around the base of the mountain are abundant. Little and Big Butte creeks drain the southern portion of the Crater Lake National Forest. Bear Creek, formerly called Stewart Creek, drains the famous fruit section of the Rogue River valley; Applegate Creek

[1] Diller, J. S., Geology of Crater Lake National Park: Prof. Paper U. S. Geol. Survey No. 3, 1902, p. 60.

drains the Siskiyou Mountains; and Illinois River the territory to the south of the main stream near the coast, a portion of which is in the Siskiyou National Forest.

The drainage area is, in general, mountainous, elevations ranging from sea level at Gold Beach to 9,760 feet at the summit of Mount McLaughlin (formerly known as Mount Pitt), a snow-capped peak dividing the drainage of Big Butte and Little Butte creeks. The general elevation of the mountain range at the headwaters of the Rogue is 6,000 feet. Prospect is 3,000 feet, Ashland is 1,938 feet, and Grants Pass 956 feet above sea level.

The area is almost entirely forested. The mean annual rainfall at Gold Beach is 86 inches, at Grants Pass 33, at Ashland 27, on the headwaters of Illinois River 70, and at Crater Lake 100 inches. On the headwaters of the stream a large part of the precipitation during the winter months is in the form of snow. The rainfall is sufficient for the production of crops without irrigation, but much better crops can be produced with the application of water.

Fish Lake ditch, which diverts water from Little Butte Creek, is the largest in operation. A number of little ditches are used to irrigate the narrow valley lands contiguous to the small streams. In this manner Ashland, Wagner, and Applegate creeks are largely appropriated for irrigation. It is realized that the agricultural resources of this section of the country will not be utilized in the most economic manner until irrigation is practiced extensively. The valley lands in the vicinity of Grants Pass along Bear Creek are particularly adapted to fruit culture, and the Rogue River valley has become justly famous for the excellent quality of its apples, pears, and other fruits.

The streams of this area, like others draining the Cascade Mountains, afford wonderful opportunities for water-power development. At present the only important plants are those of the Rogue River Electric Co. at Gold Hill and at Prospect.

NORTH FORK OF ROGUE RIVER AT PROSPECT, OREG.

This station, which is located in sec. 29, T. 32 S., R. 3 E., just above the dam of the Rogue River Electric Co., half a mile above Prospect, 5 miles above the junction with the South Fork, and at the head of Rogue River gorge, was established July 17, 1907.

The fall of the river through the gorge is to be utilized in developing water power.

The gage used during 1907 was a vertical staff about 250 feet above the dam. During 1908 and 1909 observations were made on a staff gage at the observer's house below the dam. This gage was washed out November 23, 1909, and replaced by the observer December 10, 1909. The relation between the datum of this new gage and that previously used has not been determined.

Low-water measurements are made in a very narrow canyon where the water is extremely turbulent and the velocities are most irregular. No equipment has yet been installed for making measurements during high water. The station has not yet been rated and no estimates of daily or monthly discharge can be made.

Gage readings are furnished by the Rogue River Electric Co.

Discharge measurements of North Fork of Rogue River at Prospect, Oreg., in 1910.

Date	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 22	Ebert and Heintzleman	26	321	1.00	464
23	do	26	321	1.00	465

Daily gage height, in feet, of North Fork of Rogue River at Prospect, Oreg., for 1910.

[F. F. Graham, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	1.6	2.4	1.6	2.0	1.6	1.3	1.0	0.9	1.2	1.0	1.8
2	1.8	1.6	2.6	1.6	2.0	1.5	1.3	1.0	.9	1.2	.9	1.8
3	1.7	1.5	3.0	1.7	2.0	1.5	1.3	.9	.9	1.2	.9	3.0
4	1.6	1.5	3.0	1.7	1.9	1.5	1.3	.9	.9	1.5	.9	2.5
5	1.4	1.5	2.5	1.8	1.9	1.5	1.2	.9	1.0	1.4	.9	2.5
6	1.4	1.5	2.4	1.8	1.8	1.5	1.2	.9	1.0	1.3	.9	2.4
7	1.6	1.6	2.4	2.0	1.8	1.6	1.2	.9	1.0	1.2	1.0	2.3
8	1.6	1.6	2.3	2.0	1.8	1.6	1.2	1.0	1.0	1.0	1.5	2.0
9	1.5	1.6	2.2	2.0	1.8	1.6	1.2	1.0	1.0	1.0	2.0	2.0
10	1.5	1.6	2.1	2.0	1.9	1.6	1.2	1.0	1.0	1.0	1.8	2.0
11	1.4	1.6	2.1	2.0	1.9	1.7	1.1	1.0	1.0	1.0	1.7	2.0
12	1.4	1.6	2.1	1.9	2.0	1.7	1.1	1.0	1.0	1.1	1.2	1.9
13	1.4	1.6	2.1	1.9	2.0	1.6	1.0	1.0	1.0	1.2	1.2	1.9
14	1.4	1.5	2.0	1.9	2.1	1.6	1.0	1.0	1.0	1.1	1.1	1.8
15	1.4	1.6	2.0	2.0	2.1	1.5	1.0	1.0	1.0	1.1	1.1	1.8
16	1.5	1.7	1.9	2.0	2.1	1.5	1.0	1.0	1.0	1.1	1.1	1.8
17	1.5	1.7	1.9	2.0	2.0	1.4	1.0	1.0	1.0	1.1	1.1	1.7
18	1.5	1.7	1.9	2.1	2.0	1.4	1.0	1.0	1.0	1.2	1.2	1.6
19	1.5	1.8	1.9	2.1	2.0	1.4	1.0	1.0	1.4	1.3	1.2	1.5
20	1.6	1.8	1.9	2.1	1.9	1.4	1.0	1.0	1.5	1.2	1.3	1.4
21	1.7	1.8	1.8	2.0	1.9	1.4	1.0	1.0	1.4	1.1	1.3	1.3
22	1.8	1.9	1.8	2.0	1.9	1.4	1.0	1.0	1.3	1.1	2.0	1.3
23	1.8	2.0	1.8	2.0	1.9	1.4	1.0	1.1	1.2	1.0	2.6	1.3
24	1.8	2.0	1.7	2.0	1.8	1.3	1.0	1.1	1.0	1.0	3.0	1.4
25	1.8	1.9	1.7	2.0	1.8	1.3	1.0	1.1	1.0	1.0	2.5	1.3
26	1.7	1.9	1.7	2.0	1.7	1.3	1.0	1.1	1.0	1.0	2.0	1.3
27	1.7	1.9	1.7	2.0	1.6	1.3	1.0	1.1	1.0	1.0	2.0	1.2
28	1.8	2.0	1.7	2.1	1.6	1.3	1.0	1.0	1.1	1.0	2.4	1.2
29	1.8	.....	1.7	2.2	1.6	1.3	1.0	1.0	1.1	1.0	2.6	1.2
30	1.7	.....	1.6	2.1	1.6	1.3	1.0	1.0	1.2	1.0	2.3	1.2
31	1.7	.....	1.6	.....	1.6	.....	1.0	.9	.....	1.0	.....	1.2

NOTE.—No ice at this station.

ROGUE RIVER AT TRAIL, OREG.

This station, which is in sec. 3, T. 34 S., R. 1 W., about 1,500 feet above the post office at Trail, Oreg., and above the mouth of Trail Creek, was established August 24, 1910.

The principal tributaries in the vicinity of the station are Elk Creek, which enters about 3 miles above, and Trail Creek, which enters just below.

The gage is a vertical rod spiked to an ash tree on the right bank. Its datum has not been changed since the station was established.

Discharge measurements are made from the county ferry 2 miles below the gage and the flow of Trail Creek is subtracted to give the discharge at the gage.

The relation between gage height and discharge is unaffected by ice or by artificial control.

The following discharge measurement was made by F. C. Ebert:

August 24: width, 183 feet; area, 644 square feet; gage height, 1.88 feet; discharge, 1,210 second-feet.

Daily gage height, in feet, of Rogue River at Trail, Oreg., for 1910.

Day.	Dec.	Day.	Dec.	Day.	Dec.
1		11	3.5	21	1.9
2		12	3.0	22	1.9
3		13	2.9	23	1.9
4	2.0	14	2.8	24	1.9
5	2.3	15	2.8	25	1.8
6	2.5	16	2.7	26	1.8
7	2.7	17	2.4	27	1.7
8	3.0	18	2.1	28	1.6
9	3.5	19	2.1	29	1.6
10	3.7	20	2.0	30	1.6
				31	1.5

NOTE.—No ice at this station.

ROGUE RIVER NEAR TOLO, OREG.

This station, which is located just below the power plant dam of the Rogue River Electric Co., at Gold Ray, Oreg., 1½ miles below Tolo and below the confluence of Bear Creek, was established August 30, 1905.

The staff gage is fastened to a pier of the highway bridge about 250 feet below the dam and below the tailrace of the power house. Its datum has remained unchanged since the station was established.

Discharge measurements are made from a cable about 300 feet below the gage.

The flow at this station is affected by the operation of the power plant.

A good rating curve has been constructed and the records may be considered reliable.

Discharge measurements of Rogue River near Tolo, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 18	Heintzleman and Ebert	184	1,050	0.99	1,340
29	F. C. Ebert	189	1,040	.98	1,310
Dec. 1	B. F. Heintzleman	199	1,600	3.8	5,410

NOTE.—No ice at this station.

Daily gage height, in feet, of Rogue River near Tolo, Oreg., for 1910.

[Rogue River Electric Co., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.95	4.1	7.85	2.6	2.8	2.1	1.5	1.05	0.8	0.8	0.8	3.95
2	2.8	3.55	7.45	2.65	2.8	2.1	1.5	1.0	.8	.8	.7	3.35
3	2.65	3.3	6.15	2.4	2.75	2.1	1.5	1.0	.8	.8	.7	7.85
4	2.35	3.2	5.65	2.4	2.65	2.1	1.5	1.0	.8	1.0	.7	6.2
5	2.25	3.1	5.05	2.4	2.6	2.1	1.5	1.1	.8	1.0	.7	4.6
6	2.2	3.0	4.6	2.4	2.55	2.1	1.5	1.1	.8	1.0	.7	4.05
7	2.2	2.9	4.3	2.3	2.45	2.05	1.5	1.1	.8	.95	.75	3.4
8	2.2	2.8	4.1	2.2	2.4	2.0	1.5	1.1	.8	.9	2.05	3.7
9	2.2	2.7	4.0	2.2	2.3	1.9	1.5	1.1	.8	.9	2.4	4.9
10	2.2	2.75	4.0	2.2	3.1	1.9	1.5	1.1	.8	.9	1.8	4.4
11	2.15	2.65	3.95	2.2	3.05	1.9	1.4	1.1	.8	.9	1.85	4.35
12	2.2	2.65	3.85	2.2	2.95	1.9	1.4	1.1	.8	1.1	1.65	3.95
13	2.15	2.6	3.95	2.1	2.6	1.9	1.4	1.1	.8	1.2	1.6	3.3
14	2.15	2.5	4.0	2.1	2.55	1.9	1.4	1.1	.8	1.1	1.6	3.1
15	2.2	2.4	4.0	2.1	2.5	1.9	1.4	1.1	.8	1.05	1.6	2.8
16	2.15	2.5	4.0	2.1	2.55	1.9	1.4	1.1	.8	1.0	1.6	2.8
17	2.1	2.65	3.8	2.25	2.4	1.9	1.4	1.1	.8	1.0	1.6	3.0
18	2.15	3.15	3.85	2.3	2.4	1.9	1.35	1.1	.8	1.0	1.85	2.9
19	2.3	4.85	4.0	2.6	2.4	1.9	1.3	1.1	.8	.9	1.9	2.8
20	2.1	3.95	3.85	2.95	2.3	1.9	1.3	1.1	.85	.9	1.7	2.75
21	2.1	3.2	3.85	2.8	2.3	1.9	1.25	1.1	.9	.9	1.8	2.5
22	3.15	2.9	3.9	3.0	2.3	1.85	1.2	1.1	.85	.9	2.65	2.5
23	3.75	3.0	4.85	3.0	2.3	1.8	1.2	1.1	.8	.8	5.45	2.35
24	3.95	5.35	4.0	3.1	2.3	1.8	1.2	1.1	.8	.8	4.35	2.55
25	3.45	6.1	3.65	2.95	2.3	1.8	1.1	1.1	.8	.8	3.45	2.3
26	3.15	5.25	3.45	2.9	2.3	1.75	1.1	1.1	.8	.8	2.55	2.2
27	3.1	4.7	3.05	2.85	2.3	1.6	1.1	1.1	.8	.8	3.55	2.15
28	3.65	6.2	3.0	2.75	2.25	1.6	1.1	1.0	.8	.8	12.05	2.1
29	4.1	.....	3.0	2.85	2.2	1.5	1.1	.95	.8	.8	8.15	2.0
30	3.8	.....	2.7	2.95	2.2	1.5	1.1	.85	.8	.8	4.8	2.0
31	3.75	.....	2.6	.....	2.2	.....	1.1	.8	.....	.8	.....	2.0

NOTE.—No ice at this station.

Daily discharge, in second-feet, of Rogue River near Tolo, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,920	6,280	16,800	3,350	3,670	2,580	1,810	1,380	1,180	1,180	1,180	5,940
2	3,670	5,060	15,600	3,430	3,670	2,580	1,810	1,330	1,180	1,180	1,120	4,660
3	3,430	4,560	11,800	3,030	3,590	2,580	1,810	1,330	1,180	1,180	1,120	16,800
4	2,960	4,370	10,300	3,030	3,430	2,580	1,810	1,330	1,180	1,330	1,120	11,900
5	2,800	4,180	8,680	3,030	3,350	2,580	1,810	1,420	1,180	1,330	1,120	7,490
6	2,730	4,000	7,490	3,030	3,270	2,580	1,810	1,420	1,180	1,330	1,120	6,160
7	2,730	3,830	6,750	2,880	3,110	2,510	1,810	1,420	1,180	1,290	1,150	4,750
8	2,730	3,670	6,280	2,730	3,030	2,440	1,810	1,420	1,180	1,250	2,510	5,380
9	2,730	3,510	6,050	2,730	2,880	2,300	1,810	1,420	1,180	1,250	3,030	8,270
10	2,730	3,590	6,050	2,730	4,180	2,300	1,810	1,420	1,180	1,250	2,170	6,990
11	2,660	3,430	5,940	2,730	4,090	2,300	1,700	1,420	1,180	1,250	2,240	6,870
12	2,730	3,430	5,710	2,730	3,920	2,300	1,700	1,420	1,180	1,420	1,980	5,940
13	2,660	3,350	5,940	2,580	3,350	2,300	1,700	1,420	1,180	1,510	1,920	4,560
14	2,660	3,190	6,050	2,580	3,270	2,300	1,700	1,420	1,180	1,420	1,920	4,180
15	2,730	3,030	6,050	2,580	3,190	2,300	1,700	1,420	1,180	1,380	1,920	3,670
16	2,660	3,190	6,050	2,580	3,270	2,300	1,700	1,420	1,180	1,330	1,920	3,670
17	2,580	3,430	5,600	2,800	3,030	2,300	1,700	1,420	1,180	1,330	1,920	4,000
18	2,660	4,280	5,710	2,880	3,030	2,300	1,650	1,420	1,180	1,330	2,240	3,830
19	2,880	8,140	6,050	3,350	3,030	2,300	1,600	1,420	1,180	1,250	2,300	3,670
20	2,580	5,940	5,710	3,920	2,880	2,300	1,600	1,420	1,220	1,250	2,040	3,590
21	2,580	4,370	5,710	3,670	2,880	2,300	1,560	1,420	1,250	1,250	2,170	3,190
22	4,280	3,830	5,820	4,000	2,880	2,240	1,510	1,420	1,220	1,250	3,430	3,190
23	5,490	4,000	8,140	4,000	2,880	2,170	1,510	1,420	1,180	1,180	9,760	2,960
24	5,940	9,480	6,050	4,180	2,880	2,170	1,510	1,420	1,180	1,180	6,870	3,270
25	4,850	11,600	5,270	3,920	2,880	2,170	1,420	1,420	1,180	1,180	4,850	2,880
26	4,280	9,220	4,850	3,830	2,880	2,100	1,420	1,420	1,180	1,180	3,270	2,730
27	4,180	7,750	4,090	3,750	2,880	1,920	1,420	1,420	1,180	1,180	5,060	2,660
28	5,270	11,900	4,000	3,590	2,800	1,920	1,420	1,330	1,180	1,180	31,000	2,580
29	6,280	.....	4,000	3,750	2,730	1,810	1,420	1,290	1,180	1,180	17,700	2,440
30	5,600	.....	3,510	3,920	2,730	1,810	1,420	1,220	1,180	1,180	8,010	2,440
31	5,490	.....	3,350	.....	2,730	.....	1,420	1,180	.....	1,180	.....	2,440

NOTE.—Daily discharge determined from a rating curve fairly well defined between 1,250 and 6,000 second-feet.

Monthly discharge of Rogue River near Tolo, Oreg., for 1910.

[Drainage area, 2,020 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	6,280	2,580	3,600	1.78	2.05	221,000	B.
February	11,900	3,030	5,240	2.59	2.70	291,000	B.
March	16,800	3,350	6,750	3.34	3.85	415,000	B.
April	4,180	2,580	3,240	1.60	1.78	193,000	B.
May	4,180	2,730	3,180	1.57	1.81	196,000	B.
June	2,580	1,810	2,290	1.13	1.26	136,000	B.
July	1,810	1,420	1,640	.812	.94	101,000	C.
August	1,420	1,180	1,390	.688	.79	85,500	C.
September	1,250	1,180	1,180	.584	.65	70,200	C
October	1,510	1,180	1,260	.624	.72	77,500	C.
November	31,000	1,120	4,270	2.11	2.35	254,000	C.
December	16,800	2,440	4,940	2.45	2.82	304,000	B.
The year	31,000	1,120	3,240	1.60	21.72	2,340,000	

MILL CREEK AT PROSPECT, OREG.

This station, which is located in sec. 29, T. 32 S., R. 3 E., 50 feet above the highway bridge at Prospect, Oreg., 1 mile above the mouth of the creek, and below all tributaries, was established August 23, 1910, in cooperation with the United States Forest Service.

The gage is a rod fastened to a pine stump on the right bank. Its datum has not been changed.

Discharge measurements are made by wading in the vicinity of the gage.

As the station has not yet been rated estimates of daily or monthly discharge can not be made.

The following discharge measurement was made by wading by Heintzleman and Ebert:

August 23: Width, 23 feet; area, 41 square feet; gage height, 2.04 feet; discharge, 46 second-feet.

Daily gage height, in feet, of Mill Creek at Prospect, Oreg., for 1910.

[G. H. West, observer.]

Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.
1				11			2.2	21		2.1	
2		2.0		12			2.2	22			
3				13			2.1	23	2.0		
4		2.0		14			2.1	24			
5				15		2.0		25			
6				16			2.1	26	2.0	2.0	
7				17			2.1	27	2.0		
8		2.0		18			2.1	28			
9				19			2.1	29	2.0		
10			2.1	20				30	2.0	2.0	
								31	2.0		

SOUTH FORK OF BIG BUTTE CREEK AT BUTTE FALLS, OREG.

This station, which is located in the SE. ¼ sec. 11, T. 35 S., R. 2 E., at the county bridge one-half mile above Butte Falls, Oreg., and 2 miles above the confluence of the North Fork, was established September 20, 1910.

The gage is a board spiked to the bridge pier on the left side of the stream.

Discharge measurements at low and medium stages are made by wading; at high stages measurements may be made from the county bridge.

The relation between gage height and discharge is not affected by ice.

As the station has not yet been rated, estimates of daily and monthly discharge can not be made.

Discharge measurements of South Fork of Big Butte Creek at Butte Falls, Oreg., in 1910.

Date	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 20	B. F. Heintzleman	51	50.3	1.41	123
Nov. 24	do	49	76.9	1.88	344

Gage height, in feet, of South Fork of Big Butte Creek at Butte Falls, Oreg., for 1910.

[Amos Boughton, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		1.4	1.4		16		1.4		2.0
2		1.4	1.4	2.0	17			1.4	2.0
3		1.4	1.4	2.3	18		1.4	1.6	
4		1.4			19		1.4	1.5	2.0
5		1.4		2.1	20		1.4	1.5	1.8
6		1.4	1.4		21	1.4	1.4	1.5	1.8
7		1.4	1.4	1.9	22	1.4	1.4	1.6	1.8
8		1.4	1.8		23	1.4	1.4	2.2	1.7
9		1.4	1.5	2.1	24	1.4	1.4	1.9	1.9
10				2.2	25	1.4	1.4		1.8
11					26	1.4	1.4	1.6	
12		1.5	1.5		27	1.4			1.8
13		1.4	1.4	2.0	28	1.4		3.2	
14		1.4	1.4		29		1.4		1.8
15				1.9	30	1.4	1.4	2.2	
					31		1.4		1.9

SOUTH FORK OF LITTLE BUTTE CREEK NEAR LAKE CREEK, OREG.

This station, which is located in sec. 11, T. 37 S., R. 2 E., at the county bridge, about 8 miles above Lake Creek, Oreg., and the junction of North and South forks, was established September 22, 1910.

The whole drainage area of the stream above this station is in the Crater Lake National Forest.

The gage is a board spiked to the pier of the bridge on the right side of the stream.

Discharge measurements are made by wading in the vicinity of the gage at low and medium stages; at high stages measurements may be made from the county bridge.

The relation between gage height and discharge is not affected by ice.

As the station has not yet been rated the daily and monthly discharge can not be determined.

Discharge measurements of South Fork of Little Butte Creek near Lake Creek, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 22	B. F. Heintzleman	36	25.1	0.87	17.1
Nov. 26	do	48	35	1.18	46.5

Daily gage height, in feet, of South Fork of Little Butte Creek near Lake Creek, Oreg., for 1910.

[W. T. Kinney, observer.]

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1		2.2	11		1.0	21		1.3
2		2.3	12		1.0	22		1.2
3		2.4	13		1.5	23		
4		2.2	14		1.3	24		1.0
5		2.0	15		1.0	25		1.1
6		1.8	16		1.0	26	1.2	1.2
7		1.6	17		1.3	27	1.3	1.1
8		1.2	18		1.5	28	2.1	1.0
9		1.0	19		1.8	29	2.0	1.0
10		1.0	20		1.7	30	2.0	1.1
						31		1.2

NOTE.—No ice at this station.

LITTLE BUTTE CREEK NEAR EAGLE POINT, OREG.

Little Butte Creek is formed near Lake Creek in Jackson County, by the union of its North and South forks, and flows westward to its junction with Rogue River about 3 miles east of Table Rock.

The creek is used to a large extent for irrigation, and it also furnishes a water supply for the city of Medford. It is practically the only reliable source of water for complete irrigation of the upper Rogue River valley. This valley is drained directly by Bear Creek and comprises about 60,000 acres of agricultural land, nearly all of which is susceptible of intensive agriculture.

The gaging station, which is located at Tronson & Guthrie's fruit ranch, 1 mile above Eagle Point, about 2 miles above the mouth of Antelope Creek, and above the head of a ditch which diverts water for milling at Eagle Point, was established July 13, 1907.

A number of small ditches divert water from the stream above the station, so that the discharge determined does not wholly represent the natural run-off from the drainage area.

The gage is a vertical staff spiked to an ash tree on left bank 40 feet below the bridge. Its datum has not been changed during the maintenance of the station.

The relation between gage heights and discharge is not affected by ice.

A fair discharge rating curve has been constructed and the record may be considered good.

Discharge measurements of Little Butte Creek near Eagle Point, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq ft.*	*Feet.*	*Sec.-ft.*
Aug. 20	Heintzleman and Ebert	66	137	0.77	41.1
25	do	66	138	.74	42.4
Sept. 19	B. F. Heintzleman	66	137	1.02	67.0
Dec. 5	do	65	137	2.25	387

Daily gage height, in feet, of Little Butte Creek near Eagle Point, Oreg., for 1910.

[H. P. Tronson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.75	3.15	3.15	2.15	1.75	1.2	0.9	0.8	0.75	1.3	1.2	2.4
2	1.6	3.1	3.3	2.0	1.7	1.15	.9	.8	.75	1.3	1.2	2.0
3	1.55	2.95	4.05	2.0	1.7	1.15	.9	.75	.75	1.3	1.2	6.3
4	1.5	2.85	3.9	1.9	1.65	1.15	.8	.75	.75	1.3	1.2	4.0
5	1.5	2.8	3.8	1.9	1.6	1.1	.8	.75	.75	1.3	1.2	3.3
6	1.5	2.65	3.75	1.9	1.6	1.1	.8	.75	.75	1.3	1.2	3.1
7	1.45	2.55	3.7	1.85	1.6	1.1	.8	.75	.75	1.3	1.55	3.7
8	1.45	2.35	3.7	1.85	1.5	1.1	.8	.75	.75	1.3	1.35	3.5
9	1.4	2.3	3.6	1.8	1.5	1.0	.8	.75	.75	1.3	1.25	2.8
10	1.4	2.3	3.5	1.8	1.8	1.0	.8	.75	.75	1.3	1.25	3.0
11	1.4	2.5	3.35	1.8	1.75	1.0	.8	.75	.75	1.35	1.25	2.3
12	1.4	2.35	3.25	1.8	1.7	1.0	.8	.75	.75	1.4	1.25	2.2
13	1.5	2.2	3.2	1.8	1.65	1.0	.8	.75	.75	1.35	1.25	1.9
14	1.5	2.4	3.1	1.7	1.6	1.0	.8	.75	.75	1.3	1.25	1.9
15	1.45	2.3	3.1	1.7	1.55	1.0	.8	.75	.75	1.3	1.25	1.8
16	1.45	2.2	3.0	1.7	1.55	1.0	.8	.75	.75	1.3	1.25	1.9
17	1.4	2.35	3.0	1.65	1.5	1.0	.8	.75	.75	1.3	1.55	2.0
18	1.4	3.25	2.9	1.6	1.5	1.0	.8	.75	.8	1.25	1.35	2.0
19	1.4	2.9	2.85	1.6	1.4	1.0	.8	.75	1.0	1.25	1.25	1.9
20	1.35	2.5	2.8	1.5	1.4	1.0	.95	.75	1.2	1.2	1.25	1.85
21	1.35	2.4	4.1	1.5	1.4	1.0	.9	.75	1.2	1.2	1.3	1.7
22	1.3	2.3	4.25	1.5	1.35	0.95	.9	.75	1.2	1.2	1.4	1.5
23	1.3	2.3	3.65	1.45	1.35	.95	.8	.75	1.2	1.2	3.4	1.5
24	1.3	3.2	3.25	1.45	1.3	.9	.8	.75	1.2	1.2	2.9	1.9
25	2.1	2.6	2.95	1.45	1.3	.9	.8	.75	1.25	1.2	2.5	1.5
26	2.0	3.2	2.9	1.4	1.3	.9	.8	.75	1.3	1.2	2.5	1.7
27	3.45	3.6	2.65	1.4	1.25	.9	.8	.75	1.3	1.2	4.6	1.5
28	3.15	4.05	2.45	1.4	1.25	.9	.8	.75	1.3	1.2	8.3	1.5
29	3.0	.....	2.35	1.45	1.2	.9	.8	.75	1.3	1.2	4.7	1.5
30	2.9	.....	2.3	1.8	1.2	.9	.8	.75	1.3	1.2	3.35	1.45
31	3.1	.....	2.2	.....	1.2	.....	.8	.75	.....	1.2	.....	1.4

NOTE.—No ice at this station.

Daily discharge, in second-feet, of Little Butte Creek near Eagle Point, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	236	825	825	370	236	93	52	43	40	112	93	473
2	190	800	900	316	220	85	52	43	40	112	93	316
3	176	726	1,330	316	220	85	52	40	40	112	93	2,840
4	162	680	1,240	283	205	85	43	40	40	112	93	1,300
5	162	656	1,180	283	190	77	43	40	40	112	93	900
6	162	587	1,150	283	190	77	43	40	40	112	93	800
7	149	541	1,120	267	190	77	43	40	40	112	176	1,120
8	149	450	1,120	267	162	77	43	40	40	112	124	1,000
9	136	428	1,060	251	162	63	43	40	40	112	102	656
10	136	428	1,000	251	251	63	43	40	40	112	102	750
11	136	518	925	251	236	63	43	40	40	124	102	428
12	136	450	875	251	220	63	43	40	40	136	102	388
13	162	388	850	251	205	63	43	40	40	124	102	283
14	162	473	800	220	190	63	43	40	40	112	102	283
15	149	428	800	220	176	63	43	40	40	112	102	251
16	149	388	750	220	176	63	43	40	40	112	102	283
17	136	450	750	205	162	63	43	40	40	112	176	316
18	136	875	703	190	162	63	43	40	43	102	124	316
19	136	703	680	190	136	63	43	40	63	102	102	283
20	124	518	656	162	136	63	58	40	93	93	102	267
21	124	473	1,360	162	136	63	52	40	93	93	112	220
22	112	428	1,450	162	124	58	52	40	93	93	136	162
23	112	428	1,090	149	124	58	43	40	93	93	950	162
24	112	850	875	149	112	52	43	40	93	93	703	283
25	351	564	726	149	112	52	43	40	102	93	518	162
26	316	850	703	136	112	52	43	40	112	93	518	220
27	975	1,060	587	136	102	52	43	40	112	93	1,560	162
28	825	1,330	496	136	102	52	43	40	112	93	4,410	162
29	750	.....	450	149	93	52	43	40	112	93	1,730	162
30	703	.....	428	251	93	52	43	40	112	93	925	149
31	800	.....	388	.....	93	.....	43	40	.....	93	.....	136

NOTE.—Daily discharge determined from a rating curve well defined below 400 second-feet and fairly well defined between 400 and 1,000 second-feet.

Monthly discharge of Little Butte Creek near Eagle Point, Oreg., for 1910.

[Drainage area, 269 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	975	112	267	.993	1.14	16,400	A.
February	1,330	388	618	2.30	2.40	34,300	B.
March	1,450	388	880	3.27	3.77	54,100	B.
April	370	136	221	.822	.92	13,200	A.
May	251	93	162	.602	.69	9,960	A.
June	93	52	65.2	.242	.27	3,880	A.
July	58	43	44.9	.167	.19	2,760	A.
August	43	40	40.2	.149	.17	2,470	A.
September	112	40	63.8	.237	.26	3,800	A.
October	136	93	106	.394	.45	6,520	A.
November	4,410	93	461	1.71	1.91	27,400	B.
December	2,840	136	491	1.83	2.11	30,200	B.
The year	4,410	40	283	1.05	14.28	205,000	

BEAR CREEK AT TALENT, OREG.

Bear Creek, formerly known as Stewart Creek, rises in the southeastern part of Jackson County and flows northwestward to its junction with Rogue River near Tolo. Its basin comprises 380 square miles.

The gaging station, which is located in sec. 23, T. 38 S., R. 1 W., at the county highway bridge at Talent, Oreg., 500 feet above the head of a power and irrigation canal, which diverts water from the left bank, about half a mile below the mouth of Wagner Creek and 1½ miles above the mouth of Anderson Creek, was established July 11, 1907.

The vertical staff gage is attached to the bridge from which discharge measurements are made.

Any increase in the area to be irrigated from this stream will require the construction of storage reservoirs.

The conditions do not favor accurate determination of discharge. The channel shifts, measurements have been made rather infrequently, and the results obtained can be considered only fair for high and medium stages. Low-water estimates are only approximate.

Discharge measurements of Bear Creek at Talent, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 19	Heintzleman and Ebert	.....	.....	3.32	[a] 0.5
Nov. 30	B. F. Heintzleman	49	93	4.8	260

[a] Estimated.

Daily gage height, in feet, of Bear Creek at Talent, Oreg., for 1910.

[Clarence Jeffery, observer.]

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	4.0	4.55	5.25	4.5	4.2	3.7	3.6	3.4	3.3	3.55	3.65	4.8
2	3.95	4.5	5.15	4.5	4.2	3.7	3.6	3.4	3.3	3.55	3.65	4.7
3	3.9	4.4	5.1	4.45	4.3	3.7	3.6	3.35	3.3	3.5	3.6	5.45
4	4.5	4.35	5.0	4.4	4.3	3.7	3.6	3.35	3.3	3.5	3.65	5.3
5	4.5	4.25	4.95	4.4	4.3	3.7	3.6	3.3	3.3	3.5	3.65	4.7
6	4.0	4.25	4.9	4.4	4.3	3.7	3.55	3.3	3.3	3.5	3.65	4.6
7	4.0	4.25	4.8	4.4	4.3	3.7	3.55	3.3	3.3	3.5	3.6	4.5
8	4.0	4.2	4.7	4.4	4.25	3.7	3.55	3.3	3.3	3.5	3.8	4.5
9	4.0	4.2	4.7	4.4	4.3	3.65	3.55	3.25	3.3	3.5	3.8	4.9
10	4.0	4.2	4.7	4.35	4.3	3.6	3.55	2.25	3.3	3.5	3.8	4.9
11	4.0	4.2	4.7	4.3	4.2	3.6	3.55	3.25	3.3	3.65	3.85	4.9
12	3.95	4.2	4.7	4.3	4.2	3.65	3.55	3.25	3.4	3.6	3.85	4.6
13	3.95	4.2	4.7	4.3	4.2	3.65	3.5	3.2	3.45	3.6	3.85	4.6
14	3.95	4.25	4.7	4.3	4.1	3.65	3.5	3.3	3.45	3.6	3.85	4.55
15	4.0	4.2	4.65	4.3	4.05	3.65	3.45	3.3	3.4	3.6	3.85	4.5
16	4.0	4.15	4.6	4.3	4.05	3.75	3.4	3.3	3.4	3.65	3.85	4.5
17	4.0	4.25	4.6	4.25	4.0	3.7	3.4	3.3	3.4	3.65	3.85	4.6
18	4.0	4.45	4.65	4.2	3.95	3.7	3.4	3.3	3.5	3.65	3.9	4.5
19	4.0	4.5	4.65	4.2	3.95	3.7	3.4	3.3	3.5	3.65	3.8	4.5
20	4.0	4.5	4.65	4.3	3.95	3.7	3.4	3.3	3.5	3.65	3.8	4.4
21	4.2	4.4	4.65	4.25	3.95	3.7	3.4	3.3	3.5	3.65	3.85	4.4
22	4.6	4.35	4.7	4.25	3.95	3.75	3.4	3.3	3.5	3.65	3.9	4.4
23	5.0	4.35	4.7	4.2	3.9	3.7	3.4	3.3	3.5	3.65	4.75	4.35
24	5.0	6.0	4.7	4.2	3.95	3.7	3.4	3.3	3.5	3.65	4.7	4.45
25	5.0	5.35	4.7	4.15	4.0	3.7	3.4	3.3	3.45	3.65	4.3	4.45
26	4.6	4.95	4.7	4.15	4.0	3.65	3.4	3.35	3.45	3.65	4.2	4.3
27	4.35	5.0	4.6	4.1	4.0	3.6	3.4	3.35	3.45	3.65	4.25	4.35
28	4.7	5.05	4.6	4.15	4.0	3.6	3.4	3.35	3.45	3.65	5.0	4.3
29	4.5	.....	4.6	4.2	3.9	3.6	3.4	3.3	3.45	3.65	4.7	4.3
30	4.6	.....	4.55	4.3	3.85	3.6	3.4	3.3	3.45	3.65	4.8	4.3
31	4.6	.....	4.5	.....	3.8	.....	3.4	3.3	.....	3.65	.....	4.3

NOTE.—No ice at this station.

Daily discharge, in second-feet, of Bear Creek at Talent, Oreg., for 1909–10.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.[a]												
1	38	182	232	194	137	126	25	3	3	5	48	182
2	38	219	219	159	159	115	25	3	3	5	32	137
3	72	566	232	194	170	115	25	3	3	5	25	126
4	72	95	246	159	148	115	25	3	2	5	15	115
5	81	315	246	159	137	126	32	3	1	5	15	115
6	640	287	273	159	115	115	40	3	1	5	15	126
7	765	273	273	148	115	105	40	3	1	5	15	115
8	845	259	273	137	126	105	40	3	1	5	15	287
9	342	232	259	159	137	105	32	3	1	5	15	436
10	231	232	232	159	126	95	25	3		5	15	315
11	205	259	206	159	115	85	25	3	3	5	12	182
12	134	344	182	148	115	75	25	3	2	5	12	206
13	134	315	170	148	115	75	20	3	2	5	15	232
14	1,380	259	159	148	105	75	20	3	2	5	20	194
15	374	273	159	148	126	75	15	3	2	5	15	159
16	634	315	159	148	115	95	15	3	1	5	15	159
17	736	600	182	159	105	95	15	2	1	5	15	137
18	344	550	182	159	105	85	12	2	1	6	32	115
19	533	436	182	159	105	75	8	2	1	8	48	115
20	436	405	182	159	95	75	8	1	1	8	344	115
21	950	344	159	159	95	75	8	1	1		344	105
22	634	301	182	148	95	75	6	1	1	8	344	95
23	436	287	159	137	85	66	5	1	1	8	533	75
24	315	315	159	137	85	57	5	4	0.5	6	344	75
25	287	273	182	126	75	48	5	1	4	6	182	75
26	259	273	159	159	75	40	5	1	6	6	182	75
27	232	259	159	137	105	32	5	1	5	6	159	75
28	206	259	159	137	159	40	4	1	4	6	182	75
29	182	.....	182	137	137	32	3	0.5	4	5	246	75
30	182	.....	182	126	115	32	3	1	5	5	246	115
31	182	.....	182	.....	137	.....	3	2	.....	48	.....	182
1910.[b]												
1	75	194	390	182	115	25	13	2	0	9.5	19	259
2	66	182	359	182	115	25	13	2	0	9.5	19	232
3	57	159	344	170	137	25	13	1	0	6	13	452
4	182	148	315	159	137	25	13	1	0	6	19	405
5	182	126	301	159	137	25	13	0	0	6	19	232
6	75	126	287	159	137	25	9.5	0	0	6	19	206
7	75	126	259	159	137	25	9.5	0	0	6	13	182
8	75	115	232	159	126	25	9.5	0	0	6	40	182
9	75	115	232	159	137	19	9.5	0	0	6	40	287
10	75	115	232	148	137	13	9.5	0	0	6	40	287
11	75	115	232	137	115	13	9.5	0	0	19	48	287
12	66	115	232	137	115	19	9.5	0	2	13	48	206
13	66	115	232	137	115	19	6	0	4	13	48	206
14	66	126	232	137	95	19	6	0	4	13	48	194
15	75	115	219	137	85	19	4	0	2	13	48	182
16	75	105	206	137	85	32	2	0	2	19	48	182
17	75	126	206	126	75	25	2	0	2	19	48	206
18	75	170	219	115	66	25	2	0	6	19	57	182
19	75	182	219	115	66	25	2	0	6	19	40	182
20	75	182	219	137	66	25	2	0	6	19	40	159
21	115	159	219	126	66	25	2	0	6	19	48	159
22	206	148	232	126	66	32	2	0	6	19	57	159
23	315	148	232	115	57	25	2	0	6	19	246	148
24	315	634	232	115	66	25	2	0	6	19	232	170
25	315	420	232	105	75	25	2	0	4	19	137	170
26	206	301	232	105	75	19	2	1	4	19	115	137
27	148	315	206	95	75	13	2	1	4	19	126	148
28	232	330	206	105	75	13	2	1	4	19	315	137
29	182	.....	206	115	57	13	2	0	4	19	232	137
30	206	.....	194	137	48	13	2	0	4	19	259	137
31	206	.....	182	.....	40	.....	2	0	.....	19	.....	137

[a] Daily discharge determined from a curve poorly defined below about 10 second-feet and only fairly defined above that point.

Gage heights May 23 to 24 and June 11 and 18, 1909, as published in Water-Supply Paper 272, should be 4.05 instead of 4.5 feet. Suitable correction for this error has been made in the above table.

[b] Daily discharge determined from a curve that is fairly well defined.

Monthly discharge of Bear Creek at Talent, Oreg., for 1909–10.

[Drainage area, 212 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1909.							
January	1,380	38	384	1.81	2.09	23,600	C.
February	600	95	312	1.47	1.53	17,300	C.
March	273	159	197	.929	1.07	12,100	C.
April	194	126	152	.717	.80	9,040	C.
May	170	75	117	.552	.64	7,190	C.
June	126	32	81.0	.382	.43	4,820	C.
July	40	3	16.9	.080	.09	1,040	C.
August	4	.5	2.24	.011	.01	138	D.
September	6	.5	2.22	.010	.01	132	D.
October	48	5	7.1	.033	.04	437	D.
November	533	15	117	.552	.62	6,960	C.
December	436	75	148	.698	.80	9,100	C.
The year	1,380	.5	127	.599	8.13	91,900	
1910.							
January	315	57	132	.623	.72	8,120	C.
February	634	105	186	.877	.91	10,300	C.
March	390	182	243	1.15	1.33	14,900	B.
April	182	95	136	.642	.72	8,090	B.
May	137	40	93.5	.441	.51	5,750	B.
June	32	13	21.9	.103	.11	1,300	C.
July	13	2	5.79	.027	.03	356	D.
August	2	0	.29	.0014	.002	17.8	C.
September	6	0	2.53	.012	.01	151	C.
October	19	6	14.3	.068	.08	879	B.
November	315	13	82.7	.390	.44	4,920	B.
December	452	137	205	.967	1.11	12,600	
The year	634	0	93.3	.440	5.97	67,400	

APPLEGATE CREEK AT MURPHY, OREG.

Applegate Creek rises in the Siskiyou Mountains in the northwestern part of Siskiyou County, Cal., flows northeastward into Jackson County, Oreg., for about 20 miles, then turns to the northwest and unites with Rogue River about 8 miles west of Grants Pass, in Josephine County. Its drainage area comprises 606 square miles.

The gaging station, which is located in sec. 19, T. 37 S., R. 5 W., at a county highway bridge at Murphy, Oreg., 8 miles above the mouth of the creek, and 7 miles from Grants Pass, was established July 22, 1907.

The vertical staff gage is on the right bank. Its datum has not been changed since the station was established.

Discharge measurements are made from the bridge 250 feet above the gage.

Small ditches are numerous in the vicinity of the station, but most of them serve only a single farm. It has been observed that since early irrigation has been practiced the summer flow of the stream at this point is more uniformly maintained than before.

The height of the water at the gage is affected in an irregular manner by a brush dam about 600 feet below the gage. The dam is washed away, either wholly or in part, at every rise in the creek, even during irrigating seasons. The conditions were so unsatisfactory that the station was abandoned September 30, 1910.

Discharge measurements of Applegate Creek at Murphy, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 26[a]	F. C. Ebert	43.5	67.4	4.5	20.8
Sept. 24	B. F. Heintzleman	148	446	5.1	31.4

[a] Made by wading.

Daily gage height, in feet, of Applegate Creek at Murphy, Oreg., for 1910.

[J. W. Gilmore, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	6.0	6.1	6.65	5.5	5.5	5.05	4.8	4.7	4.6
2	5.9	6.0	6.7	5.5	5.5	5.0	4.85	4.65	4.6
3	5.8	6.0	6.6	5.5	5.5	5.0	4.9	4.6	4.6
4	5.7	6.0	6.4	5.5	5.5	4.95	4.9	4.6	4.6
5	5.6	5.9	6.3	5.5	5.5	4.9	4.85	4.6	4.6
6	5.55	5.85	6.2	5.55	5.5	4.9	4.85	4.55	4.6
7	5.55	5.8	6.1	5.5	5.55	4.9	4.85	4.6	4.6
8	5.5	5.75	6.05	5.5	5.55	4.85	4.85	4.6	4.6
9	5.5	5.7	6.0	5.5	5.6	4.85	4.9	4.6	4.6
10	5.45	5.65	6.0	5.5	5.7	4.85	4.9	4.6	4.6
11	5.4	5.6	5.95	5.5	5.6	4.85	4.9	4.6	4.6
12	5.4	5.6	5.95	5.5	5.5	4.85	4.7	4.6	4.6
13	5.4	5.6	5.95	5.5	5.5	4.85	4.7	4.55	4.8
14	5.4	5.6	6.0	5.5	5.5	4.8	4.7	4.55.	4.85
15	5.45	5.6	6.1	5.5	5.5	4.8	4.7	4.55	4.9
16	5.4	5.55	6.05	5.5	5.45	4.8	4.7	4.55	4.95
17	5.4	5.55	6.0	5.55	5.4	4.8	4.7	4.55	5.0
18	5.4	5.55	6.0	5.6	5.35	4.8	4.7	4.55	5.0
19	5.4	5.85	6.0	5.7	5.3	4.8	4.7	4.5	5.0
20	5.4	5.8	6.0	5.65	5.25	4.8	4.7	4.5	5.0
21	5.45	5.75	6.0	5.6	5.2	4.8	4.65	4.5	5.0
22	6.0	5.7	6.0	5.6	5.2	4.8	4.65	4.5	5.0
23	6.0	5.65	5.9	5.6	5.2	4.8	4.7	4.45	5.05
24	6.65	6.9	5.8	5.6	5.2	4.8	4.7	4.4	5.1
25	6.3	7.5	5.75	5.6	5.2	4.8	4.7	4.4	5.1
26	6.15	6.7	5.75	5.6	5.2	4.8	4.7	4.4	5.1
27	6.05	6.7	5.7	5.6	5.2	4.8	4.7	4.4	5.05
28	6.1	6.65	5.65	5.5	5.2	4.8	4.7	4.45	5.0
29	6.1	.....	5.6	5.5	5.2	4.8	4.7	4.5	5.0
30	6.15	.....	5.55	5.5	5.2	4.8	4.7	4.55	5.0
31	6.2	.....	5.5	.....	5.15	.....	4.7	4.6	.....

NOTE.—No ice at this station. Gage heights are subject to error on account of backwater from the irrigation dam below the gage.

UMPQUA RIVER BASIN.

GENERAL FEATURES.

Umpqua River is formed by the junction of its North and South forks near the city of Roseburg, in Douglas County, Oreg. The North Fork rises in Diamond Lake on the summit of the Cascade Mountains at an elevation of 5,300 feet and flows westward. The South Fork is also formed by two forks—the northern rising in Old Bailey Mountain, about 4 miles south of Diamond Lake, and the southern on the northern slope of Abbot Butte—and flows westward and northward. From the junction of its principal forks, Umpqua River takes a tortuous but in general northerly course to Elkton, beyond which its course is more nearly west until it discharges into the Pacific Ocean at Winchester Bay, in the northwestern part of Douglas County. Its drainage area at Scottsburg, just above tidewater comprises about 4,000 square miles. The North Umpqua drains 1,080 and the South Umpqua 1,990 square miles.

The important tributaries of the Umpqua are Smiths River, which drains the low mountainous area near the coast; Elk Creek, draining the divide between the Umpqua and Willamette basins; Cow Creek, which drains the divide between Rogue River and the Umpqua basin; and the North and South forks.

The country is rough and mountainous, and the streams flow in comparative narrow valleys bordered by narrow stretches of agricultural land. The general elevation of the headwaters is 6,000 feet, with a few snow-capped peaks 8,000 to 10,000 feet high. As the elevation at Roseburg is 485 feet above sea level, it is evident that the North Fork falls nearly 4,800 feet in the 75 miles from Diamond Lake to Roseburg by the river channel. The lower portion of the Umpqua has comparatively little fall, as is evidenced by the very winding character of the stream.

The region is one of the most densely forested in the United States, and probably 80 per cent of the drainage area can be classed as heavily forested. About one-fourth of the forest area is included in the National forests; the rest is owned by corporations and individuals.

The mean annual rainfall at Roseburg is 30 inches; at Drain, near the divide between the Willamette and Umpqua basins, it is 48 inches. The mouth of the stream probably receives as much as 60 inches per annum; at the headwaters the precipitation is 100 inches or more. Except on the headwaters, all the precipitation is in the form of rain during the nine months of the year from September to May.

Little or no irrigation has been practiced in the Umpqua Valley, although a few small ditches take water from the smaller creeks tributary to the North and South Forks. The agricultural products

consist of grain and fruits. For the production of apples, prunes, and similar fruits the climate and soil are especially well adapted.

Although opportunities for water-power development in this area are almost phenomenal, there are no plants of importance.

SOUTH FORK OF UMPQUA RIVER AT TILLER, OREG.

This station, which is located in sec. 33, T. 30 S., R. 2 W., 300 feet below the county bridge, one-fourth mile above Tiller, Oreg., about 28 miles east of Riddles, and just above the mouth of Elk Creek, was established November 9, 1910.

The gage is a 10-foot board spiked to an alder tree on the left bank.

Discharge measurements may be made by wading during low water and from the county bridge during high water.

The relation between gage heights and discharge is not affected by ice.

The following discharge measurement was made by B. F. Heintzleman:

November 10: Width, 122 feet; area, 157 square feet; gage height, 2.01 feet; discharge, 218 second-feet.

Daily gage height, in feet, of South Fork of Umpqua River at Tiller, Oreg., for 1910.

[H. W. Archambeau, observer.]

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1		5.05	11	2.9	4.5	21	2.95	3.25
2		4.65	12	2.4	4.1	22	3.65	3.1
3		7.45	13	2.1	3.85	23	6.3	3.05
4		7.05	14	1.9	3.55	24	4.4	3.3
5		5.60	15	1.7	3.35	25	3.6	3.2
6		4.70	16	1.6	3.35	26	3.1	3.05
7		4.55	17	1.5	4.05	27	3.0	3.1
8		4.55	18	1.9	3.85	28	12.95	3.0
9	2.5	5.65	19	2.6	3.6	29	9.4	2.95
10	2.2	4.9	20	2.8	3.45	30	6.15	3.05
						31		3.2

NOTE.—No ice at this station.

SOUTH FORK OF UMPQUA RIVER NEAR BROCKWAY, OREG.

This station which is located in sec. 15, T. 28 S., R. 6 W., just below Winston's highway bridge, 6 miles south of Roseburg, and 3 miles east of Brockway, Oreg., 3 miles below the mouth of Lookingglass Creek, 10 miles below the mouth of Myrtle Creek, and 7 miles above the confluence of the North and South forks of Umpqua River, was established December 6, 1905.

The gage is a chain which was installed on the highway bridge November 19, 1910, replacing the staff gages formerly used. The staff gages were in two sections—an inclined low-water section on the right bank; and a vertical high-water section, which was originally

located at the cable section about 300 feet below the highway bridge and was removed to the bridge January 14, 1907. The datum of the staff gages has remained unchanged. The datum of the chain gage is 1.0 foot lower than that of the staff gage. Gage heights from November 20 to December 31, 1910, have been reduced to the datum of the staff gage.

Discharge measurements were originally made from a cable about 300 feet below the bridge but this cable was destroyed by flood, January 4, 1907, and since that date measurements have been made from the highway bridge.

Discharge measurements of South Fork of Umpqua River near Brockway, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec-ft.*
Aug. 30	F. C. Ebert	130	178	−0.40	82.2
Nov. 11	B. F. Heintzleman	235	654	1.74	798

Daily gage height, in feet, of South Fork of Umpqua River near Brockway, Oreg., for 1910.

[Geo. W. Brosi, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.95	5.9	10.8	3.1	2.35	1.05	0.65	.....	.....	.....	0.05	6.2
2	4.25	5.8	9.2	3.05	2.25	1.05	.6	.....	.....	.....	.05	5.1
3	4.15	5.7	7.6	3.05	2.15	1.0	.55	.....	.....	.1	.05	8.05
4	3.95	5.5	6.85	3.05	2.15	1.0	.5	.....	.....	.65	.1	10.0
5	3.8	4.75	6.2	3.0	2.15	.95	.5	.....	.....	.65	.1	7.5
6	3.65	4.35	5.55	3.0	2.15	.95	.45	.....	.....	.65	.15	6.0
7	3.75	4.15	5.05	3.0	2.1	.9	.45	.....	.....	.6	.25	5.1
8	3.9	3.9	4.7	2.95	2.0	.7	.45	.....	.....	.55	.65	3.7
9	3.75	3.75	4.4	2.95	1.9	.75	.45	.....	.....	.5	1.6	6.1
10	3.35	3.9	4.2	2.95	2.35	.85	.4	.....	.....	.4	2.0	5.5
11	3.25	4.0	4.1	3.05	2.6	.85	.4	.....	.....	.4	1.55	4.9
12	3.2	4.0	4.05	3.2	2.4	.85	.35	.....	.....	.5	1.65	4.5
13	3.2	3.95	4.1	3.05	2.2	.85	.3	.....	.....	.65	1.7	4.1
14	3.15	4.0	4.1	2.9	2.1	.85	.3	.....	.....	.65	1.65	3.8
15	3.15	4.25	4.05	2.7	2.0	.9	.3	.....	.....	.6	1.65	3.5
16	3.1	4.15	4.0	2.6	1.85	.95	.3	.....	.....	.55	1.6	3.6
17	3.1	4.15	3.8	2.5	1.7	.95	.3	.....	.....	.5	1.6	4.1
18	3.15	4.2	3.65	2.5	1.6	.95	.2	.....	.....	.45	1.65	4.0
19	3.5	7.4	3.5	2.5	1.5	.9	.15	.....	.....	.4	2.2	3.7
20	3.55	7.1	3.7	2.6	1.45	.85	.15	.....	.....	.35	1.8	3.5
21	3.7	6.4	3.75	2.65	1.4	.85	.15	.....	.....	.2	1.6	3.3
22	4.9	5.55	3.75	2.5	1.35	.8	.1	.....	.....	.15	2.2	3.1
23	6.05	5.1	5.4	2.4	1.25	.8	.1	.....	.....	.15	2.9	2.95
24	6.9	5.05	5.2	2.3	1.25	.8	.05	.....	.....	.1	5.25	2.9
25	6.45	9.2	4.9	2.3	1.2	.8	.05	.....	.....	.1	4.0	3.15
26	6.45	8.1	4.65	2.3	1.2	.75	.05	.....	.....	.1	3.2	3.1
27	6.3	7.05	4.0	2.25	1.15	.75	.05	.....	.....	.1	2.65	3.05
28	6.2	8.45	3.65	2.15	1.15	.7	.05	.....	.....	.05	2.5	3.15
29	6.7	.....	3.4	2.1	1.15	.7	.05	.....	.....	.05	15.2	3.2
30	6.2	.....	3.3	2.05	1.1	.65	.....	−0.4	.....	.05	8.8	3.25
31	6.0	.....	3.15	.....	1.1	.....	.....	.....	.....	.05	.....	3.9

NOTE.—No ice at this station. Gage heights Nov. 20 to Dec. 31 read on chain gage on Winston bridge, about 300 feet upstream from staff gage. Gage heights for this period have been reduced to the datum of the staff gage. Gage heights July 30 to Oct. 2 are below the zero of the gage, but were erroneously recorded by the observer, and hence are not published.

Daily discharge, in second-feet, of South Fork of Umpqua River near Brockway, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
1	2,820	6,690	21,300	1,800	1,180	484	336	141	82	150	160	7,470
2	3,290	6,440	16,200	1,750	1,100	484	318	141	82	150	160	4,860
3	3,130	6,200	11,400	1,750	1,040	465	301	141	90	170	160	12,700
4	2,820	5,730	9,210	1,750	1,040	465	284	132	90	336	170	18,800
5	2,610	4,160	7,470	1,700	1,040	447	284	132	90	336	170	11,100
6	2,400	3,460	5,840	1,700	1,040	447	267	132	98	336	182	6,940
7	2,540	3,130	4,750	1,700	1,000	428	267	123	98	318	207	4,860
8	2,750	2,750	4,070	1,660	940	354	267	123	98	301	336	2,480
9	2,540	2,540	3,540	1,660	880	372	267	123	98	284	715	7,210
10	2,060	2,750	3,210	1,660	1,180	409	250	123	106	250	940	5,730
11	1,950	2,900	3,050	1,750	1,360	409	250	114	106	250	692	4,460
12	1,900	2,900	2,980	1,900	1,210	409	235	114	106	284	740	3,710
13	1,900	2,820	3,050	1,750	1,070	409	220	114	106	336	765	3,050
14	1,850	2,900	3,050	1,610	1,000	409	220	114	114	336	740	2,610
15	1,850	3,290	2,980	1,440	940	428	220	106	114	318	740	2,220
16	1,800	3,130	2,900	1,360	850	447	220	106	114	301	715	2,340
17	1,800	3,130	2,610	1,280	765	447	220	106	114	284	715	3,050
18	1,850	3,210	2,400	1,280	715	447	194	106	123	267	740	2,900
19	2,220	10,800	2,220	1,280	670	428	182	98	123	250	1,070	2,470
20	2,280	9,900	2,470	1,360	648	409	182	98	123	235	820	2,220
21	2,470	8,010	2,540	1,400	627	409	182	98	123	194	715	2,000
22	4,460	5,840	2,540	1,280	606	390	170	98	132	182	1,070	1,800
23	7,070	4,860	5,500	1,210	564	390	170	98	132	182	1,610	1,660
24	9,340	4,750	5,060	1,140	564	390	160	90	132	170	5,170	1,610
25	8,120	16,200	4,450	1,140	544	390	160	90	141	170	2,900	1,850
26	8,120	12,800	3,980	1,140	544	372	160	90	141	170	1,900	1,800
27	7,740	9,760	2,900	1,100	524	372	160	90	141	170	1,400	1,750
28	7,470	13,900	2,400	1,040	524	354	160	90	141	160	1,280	1,850
29	8,810	.....	2,110	1,000	524	354	160	82	150	160	36,100	1,900
30	7,470	.....	2,000	972	504	336	150	82	150	160	15,000	1,950
31	6,940	.....	1,850	.....	504	.....	150	82	.....	160	.....	2,750

NOTE.—Daily discharge determined from a rating curve well defined between 80 and 15,000 second-feet. Discharge for the period July 30 to Oct. 2 interpolated from discharge measurement made Aug. 30 at a stage of —.4 foot.

Monthly discharge of South Fork of Umpqua River near Brockway, Oreg., for 1910.

[Drainage area, 1,800 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	9,340	1,800	4,010	2.23	2.57	247,000	A.
February	16,200	2,540	5,890	3.27	3.40	327,000	A.
March	21,300	1,850	4,840	2.69	3.10	298,000	A.
April	1,800	972	1,450	.806	.90	86,300	A.
May	1,360	504	829	.461	.53	51,000	A.
June	484	336	412	.229	.26	24,500	A.
July	336	150	218	.121	.14	13,400	A.
August	141	82	109	.061	.07	6,700	C.
September	150	82	115	.064	.07	6,840	C.
October	336	150	238	.132	.15	14,600	A.
November	36,100	160	2,600	1.44	1.61	155,000	B.
December	18,800	1,610	4,260	2.37	2.73	262,000	A.
The year	36,100	82	2,060	1.14	15.53	1,490,000	

UMPQUA RIVER NEAR ELKTON, OREG.

This station, which is located in sec. 8, T. 23 S., R. 7 W., at Smiths Ferry, at the falls in the river 4 miles above Elkton, Oreg., was established October 18, 1905, by J. G. Kelly, of Portland, through whose cooperation the station is maintained.

No important tributaries are received by the river in the vicinity of the station, the nearest being Elk Creek, 3 miles downstream.

The inclined gage is 100 feet above the ferry on the left bank. The gage datum remained unchanged until September 3, 1910, when a new gage was installed with a datum 0.52 foot lower than that previously used. All gage heights observed in 1910 have been reduced to the datum of the new gage.

The channel is fairly permanent. The banks are high and do not overflow, although the river is subject to enormous floods.

A fair rating curve has been deduced and the record may be considered good.

Discharge measurements of Umpqua River near Elkton, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 2	F. C. Ebert	368	1,360	0.27	1,060
Nov. 14	B. F. Heintzleman	374	1,880	1.45	2,740

Daily gage height, in feet, of Umpqua River near Elkton, Oreg., for 1910.

[D. C. Higginbothom, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.1	7.7	15.5	3.45	3.15	1.0	0.7	.....	.....	0.2	0.3	9.5
2	5.8	7.55	14.5	3.25	3.0	1.0	.8	.....	.....	.15	.35	7.5
3	5.4	7.25	11.0	3.05	2.8	1.25	.9	.....	0.3	.15	.4	8.0
4	4.9	6.75	10.15	3.25	2.65	1.05	.8	.....	.3	.3	.4	10.5
5	4.75	6.35	9.9	3.55	2.5	.9	.75	.....	.3	1.2	.35	7.5
6	4.9	5.2	9.65	3.75	2.8	1.05	.65	.....	.3	1.3	.4	5.5
7	5.4	4.15	9.4	3.95	2.65	1.25	.6	.....	.3	.8	.5	3.5
8	5.65	3.85	8.65	3.6	2.75	1.1	.....	.....	.3	.6	.5	5.5
9	5.15	3.65	6.9	3.25	3.1	.9	.....	.....	.3	.5	1.6	6.7
10	4.65	3.5	6.25	3.05	3.6	.8	.....	.....	.3	.4	5.1	7.7
11	4.2	3.4	6.05	2.9	3.65	.9	.....	.....	.3	.3	4.15	6.5
12	4.0	3.35	6.7	3.05	3.25	1.0	.....	.....	.3	.4	3.2	5.65
13	3.85	4.25	5.35	3.4	3.05	.9	.....	.....	.3	.55	3.1	4.1
14	3.75	5.15	4.95	3.65	2.75	.75	.....	.....	.15	.6	2.75	5.5
15	3.35	5.4	5.0	3.25	2.6	.75	.....	.....	.15	.7	2.35	7.5
16	3.05	5.65	5.15	3.1	2.5	.75	.....	.....	.15	.8	2.1	7.0
17	2.9	5.95	5.2	3.25	2.3	.9	.....	.....	.15	.7	2.25	5.65
18	2.8	6.25	4.85	3.6	2.15	.85	.....	.....	.15	.6	1.7	5.1
19	2.75	8.5	4.4	3.4	2.25	.75	.....	.....	.5	.6	1.2	5.6
20	2.55	9.25	4.15	3.15	2.1	.95	.....	.....	.5	.5	1.3	5.1
21	2.6	8.15	4.1	3.0	2.0	1.25	.....	.....	.5	.4	1.5	6.5
22	3.0	7.75	4.45	3.0	1.9	1.3	.....	.....	.5	.4	1.3	6.0
23	5.0	7.55	7.4	3.15	1.75	1.25	.....	.....	.45	.4	2.2	5.35
24	7.5	7.85	7.15	3.0	1.65	1.05	.....	.....	.35	.3	5.0	5.1
25	7.25	11.0	6.65	2.8	1.5	1.0	.....	.....	.7	.3	9.5	5.65
26	7.05	10.0	6.4	2.65	1.4	.9	.....	.....	.6	.35	4.5	4.7
27	6.8	8.65	5.85	2.85	1.25	.8	.....	.....	.4	.4	7.0	4.25
28	6.55	8.15	4.9	3.1	1.05	.75	.....	.....	.3	.5	9.5	4.1
29	6.25	.....	4.55	3.4	1.0	.8	.....	.....	.25	.4	19.5	4.65
30	6.0	.....	4.15	3.4	1.3	.75	.....	.....	.2	.4	20.0	4.4
31	7.65	.....	3.65	.....	1.15	.....	.....	.....	.....	.3	.....	4.05

NOTE.—Gage heights Jan. 1 to July 7 reduced to datum of new gage installed Sept. 3. Gage readings July 8 to Sept. 2 were below the zero of the gage, but were erroneously recorded by the observer and hence are not published.

Daily discharge, in second-feet, of Umpqua River near Elkton, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	13,200	18,300	47,800	5,960	5,270	1,730	1,420	1,200	1,080	1,000	1,080	24,600
2	12,200	17,800	43,800	5,500	4,940	1,730	1,520	1,200	1,080	960	1,120	17,600
3	11,000	16,800	30,300	5,050	4,520	2,020	1,620	1,200	1,080	960	1,160	19,300
4	9,600	15,200	27,100	5,500	4,220	1,780	1,520	1,150	1,080	1,080	1,160	28,400
5	9,180	13,900	26,100	6,180	3,940	1,620	1,470	1,150	1,080	1,960	1,120	17,600
6	9,600	10,400	25,200	6,560	4,520	1,780	1,380	1,150	1,080	2,080	1,160	11,300
7	11,000	7,620	24,200	7,040	4,220	2,020	1,330	1,150	1,080	1,520	1,240	6,070
8	11,800	6,800	21,500	6,200	4,420	1,840	1,300	1,150	1,080	1,330	1,240	11,300
9	10,300	6,320	15,700	5,500	5,160	1,620	1,300	1,150	1,080	1,240	1,330	15,000
10	8,900	6,070	13,600	5,050	6,200	1,520	1,300	1,150	1,080	1,160	10,200	18,300
11	7,750	5,840	13,000	4,730	6,320	1,620	1,300	1,150	1,080	1,080	7,620	14,400
12	7,260	5,720	15,000	5,050	5,500	1,730	1,300	1,150	1,080	1,160	5,380	11,800
13	6,800	7,880	10,900	5,840	5,050	1,620	1,250	1,150	1,080	1,280	5,160	7,500
14	6,560	10,300	9,740	6,320	4,420	1,470	1,250	1,150	960	1,330	4,420	11,300
15	5,720	11,000	9,880	5,500	4,130	1,470	1,250	1,150	960	1,420	3,670	17,600
16	5,050	11,800	10,300	5,160	3,940	1,470	1,250	1,150	960	1,520	3,240	16,000
17	4,730	12,700	10,400	5,500	3,580	1,620	1,250	1,100	960	1,420	3,500	11,800
18	4,520	13,600	9,460	6,200	3,320	1,570	1,250	1,100	960	1,330	2,610	10,200
19	4,420	21,000	8,250	5,840	3,500	1,470	1,250	1,100	1,240	1,330	1,960	11,600
20	4,040	23,700	7,620	5,270	3,240	1,680	1,250	1,100	1,240	1,240	2,080	10,200
21	4,130	19,800	7,500	4,940	3,070	2,020	1,250	1,100	1,240	1,160	2,340	14,400
22	4,940	18,400	8,380	4,940	2,910	2,080	1,250	1,100	1,240	1,160	2,080	12,800
23	9,880	17,800	17,300	5,270	2,680	2,020	1,200	1,100	1,200	1,160	3,410	10,900
24	17,600	18,800	16,500	4,940	2,540	1,780	1,200	1,100	1,120	1,080	9,880	10,200
25	16,800	30,300	14,900	4,520	2,340	1,730	1,200	1,100	1,420	1,080	24,600	11,800
26	16,200	26,500	14,100	4,220	2,210	1,620	1,200	1,100	1,330	1,120	8,500	9,040
27	15,400	21,500	12,400	4,620	2,020	1,520	1,200	1,080	1,160	1,160	16,000	7,880
28	14,600	19,800	9,600	5,160	1,780	1,470	1,200	1,080	1,080	1,240	24,600	7,500
29	13,600	.....	8,640	5,840	1,730	1,520	1,200	1,080	1,040	1,160	64,100	8,900
30	12,800	.....	7,620	5,840	2,080	1,470	1,200	1,080	1,000	1,160	66,200	8,250
31	18,100	.....	6,320	.....	1,900	.....	1,200	1,080	.....	1,080	.....	7,380

NOTE.—Daily discharge determined from a discharge rating curve well defined between 900 and 15,000 second-feet. Daily discharge July 8 to Sept. 2 determined from a hydrograph comparison with the discharge of North Fork of Umpqua River at Winchester.

Monthly discharge of Umpqua River near Elkton, Oreg., for 1910.

[Drainage area, 3,680 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	18,100	4,040	9,930	2.70	3.11	611,000	B.
February	30,300	5,720	14,800	4.02	4.19	822,000	B.
March	47,800	6,320	16,200	4.40	5.07	996,000	B.
April	7,040	4,220	5,470	1.49	1.66	325,000	B.
May	6,320	1,730	3,730	1.01	1.16	229,000	B.
June	2,080	1,470	1,690	.459	.51	101,000	B.
July	1,620	1,200	1,290	.351	.40	79,300	C.
August	1,200	1,080	1,130	.307	.35	69,500	C.
September	1,420	960	1,100	.299	.33	65,500	A.
October	2,080	960	1,260	.342	.39	77,500	A.
November	66,200	1,080	9,410	2.56	2.86	579,000	B.
December	28,400	6,070	12,900	3.51	4.05	560,000	B.
The year	66,200	960	6,540	1.79	24.08	4,510,000	

NORTH FORK OF UMPQUA RIVER NEAR HOAGLIN, OREG.

This station, which is located at the Forest Service bridge in the Umpqua National Forest, about 20 miles above Hoaglin and about 40 miles east of Roseburg, was established November 2, 1910. Gage readings were made by Forest Service employees during the time that the bridge was under construction.

The bridge is high above the water and is located over a deep hole in the stream where current meter measurements would be impossible. The station was therefore moved early in 1911 to a point near the Boundary ranger station.

No rating table can be made for these gage readings, as the channel is probably somewhat shifting, but they have a certain value in showing the range of stage in this part of the stream.

Daily gage height, in feet, of North Fork of Umpqua River near Hoaglin, Oreg., for 1910.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1	.....	2.2	11	1.3	2.1	21	1.3	1.3
2	0.7	2.1	12	.9	2.0	22	1.4	1.3
3	.8	3.1	13	.8	1.8	23	1.3	1.3
4	.8	3.1	14	.8	1.7	24	1.7	1.4
5	.8	2.6	15	.8	1.6	25	1.4	1.3
6	.8	2.4	16	.8	1.6	26	1.2	1.3
7	.8	2.0	17	.9	1.5	27	3.7	1.3
8	1.8	2.0	18	.9	1.5	28	3.3	1.2
9	1.0	2.4	19	.9	1.4	29	3.2	.....
10	1.0	2.2	20	1.0	1.4	30	2.6	.....

NORTH FORK OF UMPQUA RIVER AT WINCHESTER, OREG.

The station, which is located at the Southern Pacific Railroad bridge at Winchester, Oreg., in sec. 25, T. 26 S., R. 6 W., about 6 miles north of Roseburg and 6 miles above the mouth of the stream, was originally established September 6, 1905, at Dixon's farmhouse, 10 miles below the mouth of the East Fork of the North Fork, 3 miles west of Oak Creek, Oreg., and 9 miles northeast of Roseburg, Oreg., and was moved to the present site November 10, 1908. As no important tributaries enter between these points, the records are comparable.

The present staff gage is in three sections and is fastened to the left pier of the railroad bridge, about 600 feet below a power plant. Several gages have been used during the maintenance of the station, but all have been referred to the same datum.

Discharge measurements are made from the railroad bridge or, at high stages, from the highway bridge 1,200 feet farther upstream.

The stream is subject to sudden floods, caused usually by chinook winds in the spring or fall, by which the snows on the headwaters of the stream are rapidly melted.

Discharge measurements of North Fork of Umpqua River at Winchester, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 23	F. C. Ebert	145	704	1.63	954
Nov. 12	B. F. Heintzleman	234	1,110	2.86	2,140

Daily gage height, in feet, of North Fork of Umpqua River at Winchester, Oreg., for 1910.

[W. J. Pearson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.6	5.0	14.5	3.7	3.4	2.6	2.1	1.7	1.55	1.70	1.6	5.8
2	4.1	4.55	10.0	3.8	3.25	2.6	2.1	1.75	1.8	1.7	1.6	5.05
3	3.7	4.3	8.5	4.25	3.35	2.55	2.1	1.7	1.5	1.8	1.65	7.55
4	3.55	4.05	7.5	4.2	3.4	2.5	2.1	1.7	1.6	3.0	1.6	8.7
5	3.4	3.9	6.8	4.0	3.4	2.5	2.05	1.7	1.55	2.3	1.65	6.4
6	3.35	3.75	6.0	4.0	3.25	2.45	2.05	1.75	1.65	2.0	1.65	5.3
7	3.45	3.65	5.4	3.9	3.2	2.45	2.05	1.8	1.6	1.9	1.65	4.85
8	3.45	3.05	5.0	3.75	3.25	2.35	2.05	1.75	1.65	1.8	3.8	4.5
9	3.3	3.0	4.8	3.9	3.3	2.35	2.0	1.7	1.65	1.75	3.5	6.6
10	3.2	3.7	4.7	3.9	4.15	2.3	2.0	1.7	1.65	1.7	2.7	5.45
11	3.15	3.8	4.75	3.85	4.3	2.45	2.0	1.75	1.6	1.8	3.25	4.85
12	3.1	3.05	4.85	3.8	3.95	2.55	2.05	1.7	1.65	2.15	2.9	4.4
13	3.0	4.0	5.0	3.7	3.7	2.45	1.9	1.7	1.6	2.3	2.5	4.05
14	3.1	4.25	5.0	3.55	3.5	2.35	1.9	1.7	1.7	2.0	2.3	3.8
15	3.05	4.1	4.9	3.5	3.35	2.3	1.9	1.7	1.65	1.85	2.15	3.55
16	3.0	3.95	4.8	3.5	3.3	2.35	2.0	1.7	1.65	1.75	2.1	3.45
17	3.1	3.8	4.7	3.5	3.1	2.5	1.9	1.65	1.65	1.8	2.0	5.05
18	3.0	4.1	4.6	3.55	3.05	2.35	1.9	1.65	1.6	1.8	2.0	4.7
19	3.85	7.3	4.8	3.8	2.95	2.35	1.9	1.65	1.6	1.9	2.7	4.1
20	3.5	5.9	4.6	4.0	2.9	2.4	1.8	1.65	1.75	1.75	2.55	3.95
21	3.45	5.0	4.35	3.75	2.85	2.4	1.8	1.6	1.8	1.85	3.25	3.8
22	4.9	4.75	4.8	3.65	2.9	2.4	1.8	1.7	1.75	1.7	4.25	3.7
23	6.3	4.7	6.1	3.7	2.9	2.4	1.75	1.6	1.7	1.75	9.70	3.45
24	6.25	5.1	5.2	3.75	2.9	2.3	1.8	1.65	1.7	1.75	5.35	3.8
25	5.4	7.7	4.7	3.8	2.9	2.2	1.8	1.65	1.7	1.7	4.0	3.7
26	4.9	6.9	4.5	3.8	2.9	2.2	1.8	1.6	1.65	1.65	3.55	3.55
27	4.5	6.65	4.3	3.65	2.8	2.15	1.8	1.6	1.65	1.65	3.35	3.7
28	7.4	10.8	4.1	3.5	2.8	2.15	1.7	1.65	1.65	1.6	15.5	3.35
29	6.6	.....	3.95	3.35	2.75	2.1	1.7	1.7	1.65	1.6	13.3	3.5
30	5.6	.....	3.7	3.5	2.7	2.1	1.75	1.6	1.65	1.65	7.8	3.5
31	5.3	.....	3.7	.....	2.6	.....	1.8	1.7	.....	1.65	.....	3.9

NOTE.—No ice at this station.

MILL CREEK NEAR ASH, OREG.

This station, which is at the outlet of Loon Lake, in the lower Umpqua River basin, in sec. 2, T. 23 S., R. 10 W., near Ash, 5 miles south of Scottsburg, Oreg., and about 7 miles above the mouth of Mill Creek, was established May 29, 1909. The station is reached by stage from Drain, Oreg.

The stream has a very heavy grade below the station and Loon Lake offers a possible site for storage.

The staff gage is on the south shore of the lake about three-fourths of a mile above the outlet and near the observer's house.

Discharge measurements are made by wading at the lower end of a pool just below the outlet of the lake. No discharge measurements were made during 1909.

On account of the effect of wind the lake heights can not be used to determine the minimum discharge of the creek during the low-water season, but they can be used to determine the total run-off from the basin.

Gage heights have been furnished by J. G. Kelly, of Portland, Oreg.

The following discharge measurement was made by B. F. Heintzleman:

November 16: Width, 47 feet; area, 40 square feet; gage height, 5.30 feet; discharge, 98.7 second-feet.

Daily gage height, in feet, of Mill Creek near Ash, Oreg., for 1910.

[John Salander, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.35	8.0	10.9	5.4	5.1	4.05	3.6	2.85	2.3	2.1	3.0	10.4
2	7.25	7.6	10.9	5.35	5.05	4.0	3.55	2.85	2.3	2.1	3.0	9.0
3	6.85	7.3	9.9	5.8	5.0	4.0	3.5	2.85	2.3	2.15	3.0	8.7
4	6.6	7.1	9.5	6.0	5.0	3.9	3.5	2.8	2.3	2.5	2.95	10.0
5	6.4	6.95	8.7	6.05	4.95	3.9	3.5	2.8	2.3	2.9	2.9	9.7
6	6.3	6.85	8.3	.....	4.9	3.9	3.5	2.8	2.25	3.1	2.9	8.9
7	6.45	6.75	7.9	.....	4.9	3.85	3.45	2.8	2.2	3.1	3.05	8.2
8	7.4	6.65	7.5	.....	4.8	3.85	3.4	2.75	2.2	3.1	4.3	7.85
9	7.8	6.6	7.3	5.6	4.7	3.8	3.4	2.75	2.2	3.2	6.4	8.0
10	7.45	6.7	7.1	5.6	4.7	3.8	3.4	2.7	2.2	3.2	6.4	7.9
11	7.2	6.85	6.9	6.0	4.7	3.8	3.35	2.7	2.15	3.2	7.8	7.7
12	7.0	7.05	6.7	7.3	4.7	3.8	3.3	2.65	2.15	3.2	7.5	7.4
13	6.8	7.1	6.5	7.25	4.65	3.8	3.3	2.65	2.1	3.4	6.7	7.1
14	6.7	8.1	6.4	6.9	4.6	3.8	3.25	2.6	2.1	3.6	6.2	6.9
15	6.7	8.7	6.25	6.65	4.5	3.8	3.2	2.6	2.1	3.7	6.1	6.7
16	6.7	8.45	6.1	6.4	4.5	3.8	3.2	2.6	2.1	3.6	5.3	6.6
17	7.0	8.2	6.0	6.25	4.4	3.75	3.15	2.6	2.1	3.5	5.15	7.1
18	7.4	8.3	5.9	6.1	4.4	3.7	3.15	2.6	2.1	3.6	5.05	7.3
19	8.6	9.15	5.8	6.0	4.35	3.7	3.1	2.55	2.1	3.6	5.05	7.1
20	8.8	9.1	5.85	5.85	4.3	3.7	3.1	2.5	2.1	3.5	5.2	6.85
21	8.4	8.7	5.95	5.75	4.3	3.8	3.1	2.5	2.15	3.5	5.8	6.7
22	8.0	8.45	5.9	5.65	4.25	3.9	3.1	2.5	2.15	3.4	7.8	6.5
23	8.0	8.6	6.0	5.55	4.2	3.9	3.1	2.45	2.15	3.35	8.8	6.4
24	8.6	9.0	6.05	5.45	4.2	3.85	3.05	2.45	2.15	3.3	9.7	6.4
25	9.0	9.55	6.1	5.4	4.2	3.8	3.0	2.4	2.1	3.25	8.5	6.5
26	9.2	9.65	6.05	5.3	4.15	3.8	3.0	2.4	2.1	3.2	7.5	6.5
27	9.3	9.6	5.95	5.2	4.1	3.7	3.0	2.4	2.1	3.15	7.1	6.6
28	9.3	10.25	5.9	5.1	4.1	3.7	2.95	2.4	2.1	3.1	10.5	6.6
29	9.4	.....	5.75	5.15	4.1	3.65	2.9	2.4	2.1	3.1	13.4	6.6
30	9.0	.....	5.65	5.1	4.1	3.6	2.9	2.35	2.1	3.05	12.0	6.6
31	8.5	.....	5.5	.....	4.1	.....	2.9	2.3	.....	3.0	.....	7.1

NOTE.—Temporary dam erected across the outlet of the lake in 1909 was partly washed out by high water in the spring of 1910, but some of it remained and affected gage heights during the summer of 1910.

SILETZ RIVER BASIN.

GENERAL FEATURES.

Siletz River rises in the mountains in the western part of Polk County, Oreg., at an altitude of about 3,000 feet above sea level, flows in a general southwesterly direction to Siletz in Lincoln County, and thence winds tortuously northward and westward until it enters the Pacific Ocean through Siletz Bay, about 6 miles northwest of Kernville. Its total length is approximately 50 miles, and its drainage area measures 320 square miles.

The basin as a whole is densely timbered, but some areas of logged-off lands may be found on the lower reaches of the stream.

The mean annual rainfall at the mouth of the river is 75 or 80 inches; at the headwaters it is undoubtedly as high as 150 inches. The annual run-off shows about 9 second-feet per square mile of drainage area. The records thus far show very little variation in the total run-off of this drainage area.

SILETZ RIVER AT SILETZ, OREG.

This gaging station, which is located in sec. 9, T. 10 S., R. 10 W., about 1 mile above Siletz Ferry at Siletz, Oreg., near the Siletz and Toledo stage road, 9 miles north of Toledo and 6 miles below the mouth of Rock Creek, was established November 25, 1905.

The gage is a staff on the right bank and is in two sections; the lower section is bolted to a 2 by 8 inch timber anchored to an alder tree on the bank; the upper portion is vertical and is spiked to an alder tree. The gage datum has not been changed.

The cable from which discharge measurements were made was washed out in 1909 and has not been replaced.

The stream is subject to sudden and violent floods, and, as the gaging station is somewhat inaccessible, it has thus far been impracticable to make high-water measurements. Estimates of daily and monthly discharge are still withheld from publication in the hope that more satisfactory records can be obtained for high stages and that the low-stage records can be improved.

Discharge measurements of Siletz River at Siletz, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 2[a]	L. R. Allen	152	175	0.96	96.8
Oct. 21	Allen and Meyers	158	384	1.80	747

[a] Measurement made by wading at the gage. Gage height affected somewhat by eel trap just below.

Daily gage height, in feet, of Siletz River at Siletz, Oreg., for 1910.

[John Kentta, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.2	5.8	12.3	2.5	1.6	2.5	2.0	1.5	1.2	2.6	1.3	3.8
2	2.2	4.9	15.6	2.7	1.6	2.8	2.0	1.5	1.2	5.4	1.3	4.0
3	2.2	4.4	10.2	2.6	1.6	2.8	1.9	1.5	1.2	4.1	1.4	4.7
4	2.15	4.4	6.8	2.5	1.6	2.7	1.9	1.4	1.2	3.7	1.4	4.5
5	3.0	4.2	5.2	2.4	1.6	2.7	1.8	1.4	1.2	3.1	1.4	4.3
6	3.0	3.6	4.8	2.3	1.6	2.6	1.8	1.4	1.2	2.5	1.5	4.1
7	2.8	3.2	4.4	3.4	1.6	2.6	1.8	1.4	1.1	2.1	7.8	4.0
8	2.9	3.0	4.0	4.8	1.6	2.6	1.8	1.4	1.1	2.1	4.0	4.3
9	3.4	3.0	3.6	4.3	1.6	2.6	1.8	1.4	1.1	1.8	3.2	4.5
10	3.2	3.1	3.3	3.8	2.8	2.6	1.8	1.4	1.1	1.9	16.1	4.0
11	3.0	3.6	3.1	3.7	2.8	2.5	1.7	1.4	1.0	1.9	8.0	3.6
12	2.8	3.8	2.8	3.3	2.7	2.5	1.7	1.4	1.0	2.1	4.6	3.2
13	2.7	4.1	2.6	3.0	2.7	2.5	1.7	1.4	1.0	1.9	3.6	2.8
14	2.7	3.8	2.5	2.8	2.6	2.4	1.7	1.4	1.0	1.8	3.1	2.6
15	2.8	3.5	2.4	2.6	2.6	2.4	1.7	1.4	1.0	1.7	2.7	2.4

Daily gage height, in feet, of Siletz River at Siletz, Oreg., for 1910—Continued.

Day	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	2.9	3.5	2.4	2.5	2.6	2.4	1.6	1.4	1.0	1.6	2.5	2.9
17	3.2	4.2	2.2	2.4	2.6	2.4	1.6	1.4	1.0	1.6	2.3	2.5
18	3.8	5.3	2.1	2.2	2.6	2.4	1.6	1.3	1.0	2.4	2.5	3.1
19	6.5	4.6	2.0	2.2	2.5	2.3	1.6	1.3	1.0	2.2	4.2	3.2
20	5.4	3.7	2.0	2.1	2.5	2.3	1.6	1.3	1.0	2.0	8.5	3.0
21	4.6	3.3	1.9	2.0	2.5	2.3	1.6	1.3	1.0	1.8	16.5	3.3
22	4.8	3.0	1.8	2.0	2.6	2.2	1.6	1.3	.9	1.8	8.4	3.1
23	5.2	2.8	1.8	1.9	2.7	2.2	1.6	1.2	.9	1.6	7.2	2.9
24	5.8	2.6	1.8	1.8	2.8	2.2	1.6	1.2	.9	1.6	5.6	3.1
25	6.5	3.1	1.8	1.8	2.7	2.1	1.6	1.2	.9	1.6	4.5	3.8
26	6.2	3.4	1.7	1.8	2.7	2.1	1.6	1.2	.9	1.5	3.7	3.3
27	5.7	4.9	1.7	1.7	2.6	2.1	1.6	1.2	1.5	1.4	3.1	3.0
28	5.8	8.2	1.6	1.7	2.6	2.0	1.6	1.2	1.6	1.4	2.7	2.8
29	5.4	.....	1.6	1.7	2.6	2.0	1.5	1.2	1.8	1.4	4.0	2.9
30	5.2	.....	1.6	1.6	2.6	2.0	1.5	1.2	1.7	1.3	3.5	3.2
31	6.6	.....	1.5	.....	2.5	.....	1.5	1.2	.....	1.3	.....	3.3

NOTE.—There was no ice at this station. Gage heights at low water affected by backwater from brush dam placed part way across the channel 75 feet below the gage.

COLUMBIA RIVER BASIN.

GENERAL FEATURES.

Columbia River has its source in Columbia Lake, in the eastern division of the Kootenai district, in British Columbia, flows northward to the fifty-second parallel of latitude, turns abruptly southward, nearly paralleling its former course, passes through a series of narrow lakes, and crosses the international boundary line near the northeast corner of the State of Washington, where it receives Clark Fork. After traversing Washington in a general southerly direction, it turns westward and forms the boundary line between Washington and Oregon; it discharges into Pacific Ocean at the forty-sixth parallel of latitude.

The total drainage area of the Columbia is estimated from the best available maps to be 259,000 square miles, divided as follows:

Area of Columbia River drainage basin.

	Square miles.
Oregon	55,370
Washington	48,000
Idaho	81,380
Montana	25,000
Nevada	5,280
Wyoming	5,270
British Columbia	38,700

Altitude within the basin range from sea level near the mouth of the river to 8,000 feet in the Rocky Mountains, 5,000 feet in the Cascade Range, 1,000 to 4,000 feet in the intervening table-lands. Many peaks in the mountain ranges extend into the region of eternal snow, the highest in the Cascade Range, including Mount Rainier

(14,360 feet), Mount Adams (12,307 feet), Mount Hood (11,225 feet), and Mount Jefferson (10,200 feet).

The principal tributaries of the Columbia River from source to mouth are listed in the following table:

Principal tributaries of Columbia River.

From the west and north.	From the east and south.
Kettle River.	Kootenai.
San Poil.	Clark Fork.
Okanogan.	Colville River.
Methow.	Spokane River.
Chelan.	Snake (Lewis Fork).
Entiat.	Walla Walla.
Wenatchee.	Umatilla.
Yakima.	Willow Creek.
Klickitat.	John Day River.
White Salmon.	Deschutes.
Lewis.	Hood.
Kalama.	Willamette.
Cowlitz.	Clatskanie.

The river is navigable in long stretches throughout its course in the United States, but owing to rapids and falls continuous navigation is not possible in the natural condition of the river.

The area drained in the Columbia includes perhaps the largest consolidated area of forests in the world, and although much of the territory has been settled for about 65 years and large areas have been cleared, the ratio of forested area to the entire area has been reduced but slightly.

From the Pacific coast eastward to the summit of the Coast Range the mean annual rainfall ranges from 100 to 150 inches. In the basins between the Coast and Cascade ranges it drops to about 40 inches per annum. It increases again to about 100 inches on the summit of the Cascade Range, and decreases very rapidly beyond the summit, until at the eastern base of the Cascades it has dropped to about 14 inches. At the mouth of Snake River the mean annual rainfall is about 9 inches, but this extremely low rainfall obtains only in the lower altitudes. Beyond this point the rainfall again increases in Washington and northern Idaho to about 20 inches, while in eastern Oregon it continues at about 9 inches or less. In the eastern areas a large proportion of precipitation appears as snow, and during the winter months the streams are more or less icebound. West of the Cascade Range, however, the winter flow of the streams is little, if any, affected by ice.

The climate of the area exhibits all the variations from the rigorous climate of the northern latitudes, as found in British Columbia and the higher table-lands of Oregon and Idaho, to the mild climate of western Oregon and Washington.

As regards agriculture, the area ranges from the extremely arid region, where irrigation is absolutely essential, through the semiarid country, where dry farming and irrigation are practiced side by side, to the humid country that, strictly speaking, is arid in the summer months. In the Willamette Valley, for instance, where the mean annual rainfall is approximately 40 inches, only 5 per cent of this amount is received during the growing season, and the fullest agricultural development will not be realized until this entire portion of the area is as completely under the irrigation ditch as are the arid portions beyond the mountains.

Columbia River and its tributaries afford at least one-third of the available water powers in the entire United States, but developments along this line have scarcely begun. About 150,000 horsepower are at present developed by water power in Oregon, Washington, and Idaho.

Lumbering has been the principal industry of the Northwest, and the streams of the country have therefore been used not only for water-power development, but for the transportation of logs from the timbered mountain slopes to the mills and factories in the valleys below. Comparatively few streams, however, carry sufficient water during the summer months, and it has been necessary to build temporary dams on a large number of streams, where the logs are stored until released by opening the gates in the dam. The "splash" thus caused usually suffices to carry the logs to their destination.

The highest recorded flood in Columbia River occurred in June, 1894. The highest floods on the tributaries are invariably caused by "chinook"—a warm wind, usually accompanied by rain, occurring in the spring and fall. The fall "chinook" usually brings the highest waters, since it may occur immediately after a heavy snow has covered the mountain ranges. The Columbia itself is not greatly affected at such times.

The following special reports contain information regarding the surface waters of Columbia River basin:

Water-Supply Paper 253, Water powers of the Cascade Range, Part I, southern Washington, contains stream-flow data and river profiles on rivers in Klickitat, White Salmon, Little White Salmon, and Lewis River drainage basins.

Supplement to First Biennial Report of the State Engineer of Oregon, 1906, contains all data on Oregon streams, compiled from published records of the United States Geological Survey.

COLUMBIA RIVER AT WENATCHEE AND HANFORD, WASH.

Observations of river heights have been made at Wenatchee since 1894 by the United States Weather Bureau. Until 1904 the gage was read only during high water, but since that year it has been read daily.

On April 10, 1910, a station was established at Hanford by the engineers of the Hanford Irrigation & Power Co., and observations of river height were made until September 30. Three current-meter measurements were made from the ferry at Hanford and referred to this gage. In October, 1910, when the stage of the river was medium low, a measurement was made at Richland Ferry, about 20 miles below Hanford, and this also was referred to the gage at Hanford.

The Columbia receives almost no inflow between Wenatchee and Hanford. Crab Creek, the only important tributary channel, carries practically no water. The channel in this part of the river is permanent, and velocities are well distributed.

The gages have been maintained at a constant datum, although there is a little uncertainty for some periods at Wenatchee. From a comparison of the gage readings at Wenatchee and Hanford there has been deduced a very satisfactory relation which will make it possible to use the measurements at Hanford in constructing a discharge rating curve for Wenatchee. Computations of daily discharge are withheld pending further measurements.

Discharge measurements of Columbia River at Hanford, Wash., in 1910.

Date	Hydrographer	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 22-24	Hill and Mead	1,830	34,000	63.11	182,000
Apr. 30-May 3	do	1,880	42,200	67.93	266,000
May 11-13	do	1,930	47,100	71.43	328,000
Oct. 31 [a]	Ebert and Storey	1,110	31,000	56.25	84,400

[a] Measured at Richland Ferry, 20 miles below Hanford.

Daily gage height, in feet, of Columbia River at Hanford, Wash., for 1910.

[Hanford Irrigation & Power Co., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1					68.1	72.05	68.05	64.35	57.1
2					68.2	72.05	68.0	64.2	57.05
3					68.4	71.95	67.8	63.9	56.8
4					68.6	71.65	67.6	63.7	56.6
5					68.65	71.35	67.45	63.3	56.25
6					68.75	71.15	67.2	63.0	56.0
7					69.0	70.95	67.05	62.6	55.8
8					69.45	70.8	66.95	62.2	55.7
9					69.95	70.65	66.9	61.8	55.6
10					70.5	70.45	66.8	61.5	55.1
11					71.05	70.4	66.8	61.25	55.45
12					71.5	70.55	66.65	61.2	55.4
13				59.6	72.0	70.6	66.6	61.1	55.3
14				60.0	72.1	70.65	66.5	61.0	55.2
15				60.4	72.1	70.55	66.4	60.9	55.2
16				60.8	72.1	70.5	66.3	60.85	55.1
17				61.0	72.0	70.45	66.2	60.75	55.0
18				61.2	71.85	70.3	66.05	60.65	54.9
19				61.35	71.95	70.1	66.0	60.5	54.8
20				61.6	71.95	69.95	66.0	60.3	54.75

Daily gage height, in feet, of Columbia River at Hanford, Wash., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
21	.....	.....	.....	61.9	71.85	69.85	66.1	60.1	54.75
22	.....	.....	.....	62.5	71.75	69.65	66.15	59.85	54.6
23	.....	.....	.....	63.2	71.65	69.55	66.1	59.5	54.55
24	.....	.....	.....	63.7	71.85	69.35	65.95	59.3	54.5
25	.....	.....	.....	64.1	72.0	69.15	65.8	59.05	54.5
26	.....	.....	.....	64.5	72.2	68.95	65.6	58.75	54.5
27	.....	.....	.....	65.2	72.2	68.75	65.45	58.5	54.45
28	.....	.....	.....	66.3	72.2	68.55	65.3	58.3	54.4
29	.....	.....	.....	67.1	72.15	68.35	65.0	58.2	54.4
30	.....	.....	.....	67.6	72.1	68.2	64.7	57.9	54.4
31	.....	.....	.....	.....	72.05	.....	64.5	57.7	.....

Daily gage height, in feet, of Columbia River at Wenatchee, Wash., for 1910.

[U. S. Weather Bureau, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.9	6.9	5.3	14.6	27.6	33.8	27.0	19.9	10.1	7.1	8.7	8.4
2	6.7	6.7	5.4	14.5	27.8	33.5	26.8	19.2	9.8	7.1	8.5	8.3
3	6.6	6.5	5.7	14.2	28.1	33.4	26.5	18.7	9.5	7.2	8.3	8.3
4	6.5	6.3	5.9	13.9	28.5	32.8	26.3	18.2	9.1	7.4	8.2	8.2
5	6.3	6.3	6.1	13.8	28.6	32.7	26.0	17.9	9.0	7.6	8.1	8.0
6	6.1	6.0	6.2	13.7	28.8	32.4	25.9	17.5	8.8	7.5	7.9	7.9
7	6.0	5.7	6.3	13.5	29.0	32.3	25.7	17.1	8.6	7.7	8.0	7.8
8	6.0	5.4	6.4	13.3	29.1	31.5	25.6	16.8	8.5	7.8	7.8	7.8
9	5.8	5.3	6.4	13.2	29.8	30.7	25.6	16.5	8.4	7.8	7.8	7.7
10	5.7	5.3	6.9	13.1	31.0	30.3	25.4	16.0	8.3	7.9	7.8	7.6
11	5.5	5.2	7.4	13.0	32.0	30.2	25.0	15.8	8.1	7.8	7.8	7.5
12	5.3	5.2	7.5	13.0	33.1	30.2	24.6	15.7	8.0	8.0	7.8	7.3
13	5.2	5.2	7.5	14.0	34.2	30.4	24.3	15.5	7.9	8.0	7.8	7.3
14	5.0	5.2	7.7	14.9	34.5	30.6	24.1	15.5	7.7	8.1	7.8	7.2
15	5.0	5.1	7.8	15.8	34.5	30.8	24.0	15.4	7.5	8.3	7.8	7.1
16	5.0	5.1	7.8	15.9	34.8	30.7	23.9	15.4	7.5	8.4	7.7	7.0
17	5.0	5.1	7.9	16.7	34.3	30.6	23.9	15.2	7.4	8.4	7.8	7.0
18	5.0	5.0	8.0	16.8	34.2	30.0	24.0	15.1	7.2	8.8	7.8	6.9
19	5.1	5.0	8.2	17.0	34.2	29.9	24.0	14.8	7.1	8.8	7.7	6.8
20	5.2	5.0	9.1	17.7	34.1	29.8	23.9	14.5	7.0	9.0	7.9	6.7
21	5.2	5.0	10.0	18.4	33.5	29.6	23.9	14.0	7.0	9.0	8.4	6.6
22	5.2	5.1	10.8	18.9	33.0	29.4	23.8	13.7	6.9	9.1	8.9	6.5
23	5.3	5.1	11.5	20.1	33.0	29.1	23.6	13.4	6.9	9.2	8.8	6.4
24	5.5	5.1	12.5	20.8	32.8	28.9	23.4	12.9	6.6	9.3	8.8	6.3
25	5.5	5.1	13.4	21.8	33.7	28.7	23.2	12.7	6.9	9.3	8.8	6.3
26	5.5	5.2	14.2	23.1	34.4	28.7	23.0	12.4	6.9	9.4	8.7	6.2
27	5.5	5.2	14.8	24.7	34.8	28.3	22.7	12.0	7.0	9.4	8.7	6.1
28	5.6	5.3	15.2	25.6	34.5	28.2	22.2	11.6	7.0	9.5	8.7	6.1
29	5.6	.....	15.1	26.4	34.0	27.5	21.7	11.2	7.1	9.3	8.6	6.1
30	5.5	.....	14.9	27.8	33.8	27.2	21.1	10.9	7.1	9.0	8.6	6.1
31	5.4	.....	14.8	.....	33.8	.....	20.5	10.6	.....	8.8	.....	6.0

COLUMBIA RIVER AT PASCO, WASH.

This station, which is located at the Northern Pacific Railway bridge at Pasco, Wash., 4 miles above the mouth of Snake River, 7 miles above the mouth of Yakima River, was established October 15, 1904.

The records of gage heights have been published by the Survey in the annual reports of stream measurements in the expectation that at some future time a rating curve could be prepared which

would be applicable to them. It has been decided, however, to use the Wenatchee gage heights in computing the discharge of the upper Columbia. The Pasco gage heights are of interest in a general study of the river system and are therefore published in the Geological Survey reports.

Daily gage height, in feet, of Columbia River at Pasco, Wash., for 1910.

[U. S. Weather Bureau, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.3	−0.8	0.1	7.3	14.0	15.0	10.8	7.5	3.1	0.2	1.9	2.2
2	1.3	− .8	2.3	7.2	13.7	15.0	10.8	7.2	2.7	.1	1.8	2.2
3	.....	− .8	5.4	7.2	13.5	15.2	10.7	6.8	2.5	.2	1.8	2.1
4	.....	− .6	7.3	7.3	13.2	15.0	10.5	6.6	2.2	.4	1.7	2.0
5	.....	− .4	7.8	7.2	13.3	14.7	10.3	6.4	2.1	.6	1.6	2.0
6	.....	− .3	7.2	7.0	13.5	14.3	10.4	6.2	1.9	.8	1	2.1
7	.....	− .3	5.5	7.0	13.7	14.0	10.0	6.1	1.8	1.0	1	2.2
8	.....	− .3	4.9	6.9	13.8	13.9	9.9	5.9	1.6	1.1	1	2.0
9	.....	− .3	4.3	7.1	14.2	13.8	9.8	5.7	1.5	1.1	1	1.8
10	.....	− .3	4.1	7.3	14.8	13.5	9.6	5.6	1.4	1.2	1	1.7
11	.....	− .3	4.0	7.6	15.4	13.3	9.5	5.5	1.4	1.2	1	1.6
12	.....	− .2	4.1	8.2	16.3	13.3	9.4	5.3	1.2	1.3	1.9	1.5
13	.....	− .2	4.3	9.0	16.4	13.2	9.3	5.1	1.0	1.3	1.9	1.5
14	.....	− .2	4.5	9.3	16.5	13.4	9.3	5.0	.9	1.3	2.0	1.4
15	.....	− .2	4.8	9.4	16.3	13.3	9.2	5.0	.8	1.4	2.0	1.3
16	.....	− .2	5.0	9.0	16.1	13.3	9.2	5.0	.7	1.4	1.9	1.2
17	.....	− .2	5.5	8.7	15.8	13.0	9.1	5.0	.6	1.5	1.8	1.1
18	.....	− .2	5.9	8.8	15.5	12.9	9.1	5.0	.6	1.5	1.7	1.0
19	− .7	− .2	6.2	9.0	15.4	12.8	9.1	5.0	.5	1.6	1.7	.9
20	− .6	− .2	6.6	9.4	15.4	12.7	9.1	4.9	.3	1.8	1.7	.8
21	− .4	− .2	8.3	10.1	15.3	12.6	9.1	4.7	.2	1.9	1.8	.6
22	− .2	.....	9.3	10.9	15.0	12.1	9.1	4.5	.2	2.0	1.9	.4
23	− .1	.....	10.0	11.0	14.9	12.0	9.1	4.3	.2	2.0	3.1	.2
24	.0	.....	10.5	11.2	14.9	11.9	8.9	4.2	.1	2.0	3.2	.0
25	1.0	−1.0	10.2	11.5	15.0	11.8	8.8	4.0	.1	2.0	3.0	.0
26	.8	−1.0	9.6	12.0	15.4	11.7	8.7	3.9	.1	2.0	2.8	.0
27	.6	−1.2	9.0	13.2	15.6	11.3	8.6	3.7	.0	2.0	2.7	.0
28	.4	−1.2	8.5	14.0	15.4	11.2	8.6	3.6	.0	2.1	2.6	−.2
29	.2	.....	8.0	14.3	15.5	11.0	8.5	3.4	.9	2.1	2.5	−.2
30	.0	.....	7.7	14.3	15.2	10.9	8.2	3.2	.8	2.2	2.4	−.2
31	− .8	.....	7.5	.....	15.0	.....	7.9	3.1	.....	2.2	.....	−.2

NOTE.—River frozen at gage Jan. 3–18 and Feb. 22–24.

COLUMBIA RIVER AT THE DALLES, OREG.

This station is located 2,000 feet below the ferry at The Dalles, Oreg., and is below the mouth of Deschutes River and above Hood and Klickitat rivers.

There are two gages at The Dalles, the Government, or Brooks gage, used by the United States Geological Survey, made up of several sections attached to piling of the viaduct connecting Regulator Dock with the warehouse; and the United States Army engineer's gage, which is similar but has a datum 8.9 feet lower than the Brooks gage.

Discharge measurements are made from a gasoline launch held in position by a cable sagging into the water in order to allow the passage of river steamers. The cable is stretched at time of each measurement.

A comparison has been made between the gage readings at The Dalles and those taken at Cascade Locks, 20 miles down the river, at which point the gage records are nearly complete for 30 years. The elevation of gage datum at The Dalles is 45.6 feet and at Cascade Locks 42.5 feet above sea level.

When the locks were formerly opened in 1896 the gage was moved and a datum 6 feet lower was used until December 31, 1899. The condition at the locks are such that a permanent rating is perfectly feasible.

Records of gage heights have been kept at The Dalles by the United States Weather Bureau since 1892. A number of measurements were made in 1903 by the United States Army engineers. In 1907 and 1908 measurements were made by the United States Geological Survey, and these in connection with earlier measurements fully develop the discharge curve.

Daily gage height, in feet, of Columbia River at The Dalles, Oreg., for 1910.

[U. S. Weather Bureau, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.1	5.4	7.5	17.0	29.2	28.9	19.5	12.1	6.2	2.3	5.5	6.9
2	3.4	4.8	10.7	16.4	28.4	29.0	19.2	12.1	5.8	2.5	5.3	6.8
3	2.9	4.5	12.5	16.4	27.8	29.2	18.9	12.0	5.6	2.7	5.3	7.1
4	3.8	3.9	17.8	16.2	27.3	29.2	18.7	11.8	5.5	3.0	5.0	7.3
5	5.0	3.3	20.3	16.5	26.8	29.0	18.3	11.7	5.4	3.0	4.8	7.1
6	5.0	3.3	20.6	16.5	26.6	28.1	17.6	11.4	5.1	3.2	4.8	7.1
7	4.8	3.3	19.5	16.1	27.2	27.3	16.9	11.0	4.7	4.1	4.8	7.6
8	4.9	3.0	17.0	15.8	27.4	26.7	16.6	10.7	4.2	4.3	4.8	7.7
9	4.0	3.0	15.2	16.1	27.5	26.2	16.1	10.6	4.0	4.5	4.7	7.6
10	4.6	3.1	14.0	16.2	28.3	25.8	15.7	10.5	4.0	4.3	5.0	6.9
11	4.5	3.0	13.0	16.9	29.6	25.5	15.3	10.1	3.8	4.3	5.8	6.5
12	4.5	2.9	13.0	17.9	31.2	25.3	14.9	10.0	3.6	4.4	6.1	6.3
13	4.7	3.1	13.0	19.2	32.7	24.9	14.6	9.8	3.5	4.4	6.5	5.9
14	5.0	3.4	13.4	20.6	33.1	25.1	14.6	9.5	3.3	4.4	6.9	5.9
15	5.5	3.4	13.7	20.8	32.9	24.9	14.4	9.4	3.1	4.3	6.9	5.7
16	5.6	3.7	14.3	20.8	32.2	24.6	14.2	9.0	3.3	4.3	6.5	5.5
17	5.6	3.2	15.0	20.1	31.8	24.3	13.9	9.0	3.0	4.6	6.3	5.4
18	5.7	3.0	15.6	19.5	31.2	23.9	13.8	8.9	2.9	4.6	6.0	5.4
19	6.7	3.0	16.3	19.3	30.7	23.7	13.8	8.9	2.7	4.4	5.8	4.6
20	5.6	3.0	16.9	19.6	30.3	23.4	13.7	9.1	2.9	4.7	5.6	4.4
21	5.6	3.2	17.8	20.6	30.0	22.8	13.6	8.9	2.9	5.0	6.3	4.6
22	4.4	2.5	21.0	22.0	29.8	22.5	13.6	8.7	2.8	5.6	6.2	4.2
23	6.5	2.3	22.4	23.2	29.2	22.1	13.5	8.4	2.6	5.6	6.5	3.8
24	6.6	2.1	23.7	23.6	28.7	21.6	13.4	7.8	2.8	5.5	8.0	3.7
25	6.1	3.0	24.4	23.7	28.8	21.3	13.2	7.3	2.3	5.4	8.6	3.9
26	5.6	3.8	23.3	24.3	29.2	21.1	13.0	7.3	2.4	5.3	8.4	3.8
27	5.5	5.3	22.0	25.8	29.6	20.7	12.9	7.4	2.4	5.0	8.0	3.7
28	5.3	6.3	21.0	27.4	30.0	20.3	12.7	7.4	2.4	5.2	7.6	3.4
29	5.0	.....	19.4	28.8	29.6	20.0	12.5	7.0	2.3	5.6	7.3	3.5
30	4.5	.....	18.3	29.2	30.0	19.8	12.3	6.7	2.3	6.0	7.2	3.5
31	4.7	.....	17.5	.....	29.3	.....	12.1	6.6	.....	5.8	.....	3.5

Daily discharge, in second-feet, of Columbia River at The Dalles, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	96,000	109,000	132,000	283,000	547,000	540,000	332,000	197,000	117,000	79,700	110,000	125,000
2	89,600	103,000	176,000	272,000	528,000	542,000	326,000	197,000	113,000	81,500	108,000	124,000
3	85,100	100,000	203,000	272,000	514,000	547,000	320,000	195,000	111,000	83,300	108,000	127,000
4	93,200	94,100	298,000	268,000	503,000	547,000	316,000	192,000	110,000	86,000	105,000	130,000
5	105,000	88,700	348,000	274,000	491,000	542,000	308,000	190,000	109,000	86,000	103,000	127,000
6	105,000	88,700	355,000	274,000	487,000	521,000	294,000	186,000	106,000	87,800	103,000	127,000
7	103,000	88,700	332,000	266,000	501,000	503,000	281,000	180,000	102,000	96,000	103,000	133,000
8	104,000	86,000	283,000	260,000	505,000	489,000	275,000	176,000	97,000	98,000	103,000	134,000
9	95,000	86,000	250,000	266,000	508,000	478,000	266,000	174,000	95,000	100,000	102,000	133,000
10	101,000	86,900	228,000	268,000	526,000	468,000	259,000	172,000	95,000	98,000	105,000	125,000
11	100,000	86,000	211,000	281,000	556,000	462,000	251,000	166,000	93,200	98,000	113,000	120,000
12	100,000	85,100	211,000	300,000	595,000	457,000	244,000	165,000	91,400	99,000	116,000	118,000
13	102,000	86,900	211,000	326,000	631,000	448,000	239,000	162,000	90,500	99,000	120,000	114,000
14	105,000	89,600	218,000	355,000	640,000	452,000	239,000	158,000	88,700	99,000	125,000	114,000
15	110,000	89,600	223,000	359,000	636,000	448,000	235,000	157,000	86,900	98,000	125,000	112,000
16	110,000	92,300	233,000	359,000	619,000	441,000	232,000	151,000	88,700	98,000	120,000	110,000
17	111,000	87,800	246,000	344,000	609,000	435,000	226,000	151,000	86,000	101,000	118,000	109,000
18	112,000	86,000	257,000	332,000	595,000	462,000	225,000	150,000	85,100	101,000	115,000	109,000
19	123,000	86,000	270,000	328,000	583,000	421,000	225,000	150,000	83,300	99,000	113,000	101,000
20	111,000	86,000	281,000	334,000	573,000	415,000	223,000	152,000	85,100	102,000	111,000	99,000
21	111,000	87,800	298,000	355,000	566,000	402,000	221,000	150,000	85,100	105,000	118,000	101,000
22	99,000	81,500	363,000	384,000	561,000	395,000	221,000	147,000	84,200	111,000	117,000	97,000
23	120,000	79,700	393,000	410,000	547,000	386,000	220,000	143,000	82,400	111,000	120,000	93,200
24	122,000	77,900	421,000	419,000	535,000	376,000	218,000	136,000	84,200	110,000	138,000	92,300
25	116,000	86,000	437,000	421,000	537,000	369,000	214,000	130,000	79,700	109,000	146,000	94,100
26	111,000	93,200	413,000	435,000	547,000	365,000	211,000	130,000	80,600	108,000	143,000	93,200
27	110,000	108,000	384,000	468,000	556,000	357,000	209,000	131,000	80,600	105,000	138,000	92,300
28	108,000	118,000	363,000	505,000	566,000	348,000	206,000	131,000	80,600	107,000	133,000	89,600
29	105,000	.....	330,000	537,000	556,000	342,000	203,000	126,000	79,700	111,000	130,000	90,500
30	100,000	.....	308,000	547,000	566,000	338,000	200,000	123,000	79,700	115,000	128,000	90,500
31	102,000	.....	292,000	.....	549,000	.....	197,000	122,000	.....	113,000	.....	90,500

NOTE.—Daily discharge determined from a rating curve well defined between 69,000 and 740,000 second-feet. The curve is the same as that used in computing the 1892 to 1909 data.

Monthly discharge of Columbia River at The Dalles, Oreg., for 1910.

[Drainage area, 237,000 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	123,000	85,100	105,000	0.443	0.51	6,460,000	A.
February	118,000	77,900	90,700	.383	.40	5,040,000	B.
March	437,000	132,000	289,000	1.21	1.41	17,800,000	B.
April	547,000	260,000	350,000	1.48	1.65	20,800,000	B.
May	640,000	487,000	556,000	2.35	2.71	34,200,000	B.
June	547,000	338,000	442,000	1.87	2.09	26,300,000	B.
July	332,000	197,000	246,000	1.04	1.20	15,100,000	B.
August	197,000	122,000	157,000	.667	.77	9,720,000	A.
September	117,000	79,700	91,700	.387	.43	5,460,000	A.
October	115,000	79,700	99,800	.421	.48	6,140,000	A.
November	146,000	102,000	118,000	.498	.56	7,020,000	A.
December	134,000	89,600	110,000	.464	.54	6,760,000	A.
The year	640,000	77,900	222,000	.937	12.75	161,000,000	

CLARK FORK BASIN.

GENERAL FEATURES.

Clark Fork of Columbia River rises in the Silverbow Mountains, Montana, about 18 miles southwest of Butte. For about 40 miles it flows northward, but near Garrison, Powell County, it turns to the northwest and maintains this general course through a distance of about 125 miles until it reaches St. Regis, in Missoula County, where it turns abruptly to the northeast. At Paradise, in Sanders County, it resumes its northwesterly course, passing between the Cœur d'Alene and Cabinet ranges, crossing the "panhandle" of Idaho in Bonner County, flowing through Lake Pend Oreille, and entering Washington at Newport in Stevens County. From Usk to the international boundary line its course is northward, and just beyond the boundary it turns directly west to its junction with the Columbia just inside Canadian territory. From source to mouth its length, exclusive of windings, is, roughly, 420 miles, and its drainage area measures 25,800 square miles. To the river thus described various names have been applied in the past [1] and may still be used locally.

The Land Office maps of Montana, Idaho, and Washington show more than 150 streams tributary to Clark Fork, but by far the greater number of these are very short, and scarcely a dozen can be called rivers. The most important are listed in the table following:

Principal tributaries of Clark Fork of Cloumbia River.

From the south and west.	From the north and east.
Flint Creek.	Little Blackfoot River.
Rock Creek.	Big Blackfoot River.
Bitterroot River.	Flathead River.
	Thompson River.
	Vermilion Creek.
	Preist River.
	Salmon River (British Columbia).

Altitudes within the basin range from 1,346 feet above sea level at Boundary to more than 8,000 feet above at the summits of some of the peaks of the Mission Range. The river has many rapids and falls, and in places the rocky gorge is narrow enough to be spanned by foot logs. The stream falls nearly 500 feet in the last 40 miles of its course.

[1] "Clark Fork; river in Idaho, Montana, and Washington. (Not Bitter Root, Bitterroot, Clarke, Clarks River, Deer Lodge, Deerlodge, Hell Gate, Hellgate, Missoula, Silver Bow, nor Silverbow.)"—Third Report U. S. Board Geog. Names, 1907, p. 51. Bitterroot in this decision refers to a portion of the main stream so called, and not to the tributary known as Bitterroot River.

A great deal of snow lies in the mountains from November to June, and many of the streams are frozen over during the winter months. Throughout the greater part of the year, however, the streams are open.

Irrigation in the Bitterroot Valley has been developed quite extensively. The United States Reclamation Service is irrigating the Flathead Indian Reservation by diverting water from the smaller streams. A project to dam Flathead River and develop power for pumping water from the lake is now under way. One hundred thousand acres will be irrigated on the Flathead.

Reservoir sites available for storage are numerous. The Mission Range has several that will be used by the Reclamation Service; also good storage-reservoir sites are to be found on the Bitterroot and upper Little Bitterroot.

The drainage basin contains many valuable power streams. On a few streams power plants have already been installed and more are under construction. The lower 20 miles of the main river offers some exceptional opportunities for power developments in large units.

CLARK FORK AT ST. REGIS, MONT.

This station, which is located at the old ferry cable about 1½ miles below St. Regis, Mont., was established October 26, 1910.

The gage is a vertical staff in two sections—the high-water section is nailed to the support of the ferry cable; the low-water section is fastened to a log.

The channel is composed of small bowlders and will not shift.

Discharge measurements are made from a cable.

Relation between gage height and discharge is not affected by ice during the winter months.

The following discharge measurement was made by Raymond Richards:

October 26, 1910: Width, 320 feet; area, 1,460 square feet; gage height, 4.90 feet; discharge, 3,880 second-feet.

Daily gage height, in feet, of Clark Fork at St. Regis, Mont., for 1910.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	4.85	5.2	11	.....	5.7	4 9	21	.....	5.5	4.2
2	.....	4.85	5.2	12	.....	5.9	4.8	22	.....	5.8	4.25
3	.....	4.8	5.15	13	.....	6.1	4.6	23	.....	5.8	4.35
4	.....	4.8	5.2	14	.....	6.1	4.5	24	.....	5.75	4.65
5	.....	4.85	5.25	15	.....	6.0	4.35	25	.....	5.6	4.6
6	.....	4.8	5.3	16	.....	5.9	4.25	26	4.9	5.5	4.65
7	.....	4.75	5.2	17	.....	6.0	4.2	27	4.95	5.4	4.6
8	.....	5.0	5.05	18	.....	5.5	4.15	28	5.0	5.25	4.5
9	.....	5.05	5.0	19	.....	5.2	4.1	29	5.05	5.2	4.4
10	.....	5.25	4.95	20	.....	5.3	4.15	30	5.0	5.15	4.3
								31	4.95	.....	4.2

CLARK FORK NEAR PLAINS, MONT.

This station, which is located at the old ferry cable, 3 miles above Plains, Mont., was established October 28, 1910.

The gage is a chain fastened to a tree just below the ferry cable.

Discharge measurements are made from the cable.

The stream remains open at the station throughout the winter.

Daily gage height, in feet, and discharge, in second feet, of Clark Fork near Plains, Mont., for 1910.

[B. E. Monaghan, observer.]

Day.	October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			5.2	9,400	6.1	13,100
2			5.2	9,400	6.1	13,100
3			5.2	9,400	6.0	12,600
4			5.3	9,760	6.0	12 600
5			5.2	9,400	6.0	12,600
6			5.3	9,760	5.9	12,200
7			5.3	9,760	5.8	11,700
8			5.4	10,100	5.8	11,700
9			5.4	10,100	5.8	11,700
10			5.5	10,500	5.7	11,300
11			5.7	11,300	5.7	11,300
12			5.9	12.200	5.7	11,300
13			6.1	13,100	5.6	10,900
14			6.1	13,100	5.6	10,900
15			6.2	13,600	5.5	10,500
16			6.2	13,600	5.4	10,100
17			6.2	13,600	5.3	9,760
18			6.2	13,600	5.3	9,760
19			6.2	13,600	5.2	9,400
20			6.2	13,600	5.2	9,400
21			6.2	13,600	5.2	9,400
22			6.3	14,100	5.1	9,060
23			6.3	14,100	5.1	9,060
24			6.4	14,700	5.2	9,400
25			6.4	14,700	5.2	9,400
26			6.4	14,700	5.2	9,400
27			6.4	14,700	5.1	9,060
28	5.2	9,400	6.3	14,100	5.1	9,060
29	5.3	9,760	6.2	13,600	5.1	9,060
30	5.2	9,400	6.2	13,600	5.1	9,060
31	5.2	9,400			5.1	9,060

CLARK FORK AT NEWPORT, WASH.

A station on Clark Fork was established at Priest River, Idaho, June 26, 1903, but was discontinued April 30, 1905. The gage was located 1,090 feet downstream from Priest River railroad station and one-fourth mile below the mouth of Priest Ri er.

Gage records were begun at Newport, Wash., by the United States Weather Bureau in April, 1904, and they have been continuous from that date, except for the months of December, January, and February. The winter records are complete for 1903 to 1906.

The Weather Bureau gage is attached to the dock of the Pend d'Oreille River Navigation Co. on the left bank of the ri er.

High-water sections are set in line with each other at several locations on the river bank.

Gage heights are furnished by the United States Weather Bureau.

By comparing simultaneous gage readings at Priest River and Newport from April, 1904, to April, 1905, a very satisfactory relation has been established.

The results of this study, including discharge measurements, rating table, and monthly discharge from 1904 to 1908, were published in Water-Supply Paper 252, pages 85–89.

No discharge measurements were made in 1910, but the conditions are practically permanent and good results have been obtained.

Daily gage height, in feet, of Clark Fork at Newport, Wash., for 1910.

[U. S. Weather Bureau, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	−0.1	6.5	13.0	13.4	7.7	2.4	−0.4	−0.7	−1.0	2.2
2	.....	.....	+ .2	6.5	13.4	13.2	7.5	2.3	− .5	− .7	−1.0	2.2
3	.....	.....	.8	6.4	13.5	13.1	7.2	2.2	− .6	− .7	−1.0	2.2
4	.....	.....	1.4	6.3	13.5	13.0	7.0	2.1	− .6	− .6	− .9	2.2
5	.....	.....	2.0	6.1	13.5	12.9	6.7	2.0	− .6	− .5	− .8	2.2
6	.....	.....	2.7	6.0	13.5	12.6	6.4	2.0	− .6	− .3	− .8	2.2
7	.....	.....	3.1	6.1	13.5	12.4	6.2	1.9	− .5	− .3	− .8	2.2
8	.....	.....	3.9	6.2	13.6	12.2	6.0	1.7	− .4	− .2	− .7	2.2
9	.....	.....	4.6	6.2	13.7	12.0	5.9	1.6	− .4	− .2	− .5	2.2
10	.....	.....	4.1	6.3	14.0	11.9	5.7	1.4	− .5	− .2	− .3	2.2
11	.....	.....	3.5	6.4	14.3	11.6	5.6	1.3	− .5	− .2	− .2	2.1
12	.....	.....	3.4	6.5	14.7	11.4	5.4	1.2	− .5	− .2	− .1	2.1
13	.....	.....	3.5	6.8	15.0	11.2	5.2	1.1	− .5	− .1	+ .2	2.0
14	.....	.....	3.5	7.1	15.1	10.4	5.0	1.0	− .6	− .1	.3	1.9
15	.....	.....	3.6	7.4	15.3	10.7	4.9	.9	− .6	− .1	.4	1.8
16	.....	.....	3.6	7.7	15.7	10.5	4.8	.8	− .7	− .1	.5	1.7
17	.....	.....	3.7	7.8	15.7	10.3	4.6	.8	− .7	− .2	.7	1.6
18	.....	.....	3.9	8.0	15.7	10.1	4.4	.7	− .7	− .3	.8	1.6
19	.....	.....	4.1	8.2	15.5	9.9	4.2	.6	− .7	− .4	1.0	1.6
20	.....	.....	4.3	8.6	15.4	9.9	4.1	.5	− .6	− .5	1.8	1.5
21	.....	.....	4.7	8.9	15.2	9.5	4.0	.4	− .6	− .6	2.2	1.4
22	.....	.....	5.0	9.2	15.0	9.5	3.9	.3	− .6	− .6	2.3	1.2
23	.....	.....	5.3	9.6	14.7	9.1	3.7	.2	− .6	− .7	2.3	1.2
24	.....	.....	5.9	9.8	14.5	9.0	3.6	.1	− .5	− .8	2.3	1.1
25	.....	.....	6.3	10.0	14.2	8.8	3.5	.0	− .4	− .9	2.4	1.1
26	.....	.....	6.6	10.5	14.1	8.6	3.3	.0	− .5	−1.0	2.4	1.1
27	.....	.....	6.8	11.0	13.9	8.4	3.1	− .1	− .5	−1.0	2.5	1.1
28	.....	.....	6.8	11.5	13.8	8.2	3.0	− .2	− .6	−1.0	2.5	1.0
29	.....	.....	6.7	12.0	13.7	8.0	2.9	− .2	− .7	−1.0	2.4	.9
30	.....	.....	6.7	12.6	13.7	7.9	2.7	− .2	− .7	−1.0	2.3	.9
31	.....	.....	6.6	.....	13.6	.....	2.5	− .3	.....	−1.0	.....	.9

NOTE.—No ice is reported at this station.

Daily discharge, in second-feet, of Clark Fork at Newport, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	20,000	13,600	11,400	38,300	75,300	77,900	44,400	19,900	10,500	9,670	8,900	19,100
2	19,200	11,800	12,300	38,300	77,900	76,600	43,400	19,500	10,200	9,670	8,900	19,100
3	16,500	11,800	14,100	37,800	78,600	76,000	41,800	19,100	9,940	9,670	8,900	19,100
4	14,700	12,000	16,100	37,300	78,600	75,300	40,800	18,700	9,940	9,940	9,150	19,100
5	15,800	13,300	18,300	36,300	78,600	74,700	39,300	18,300	9,940	10,200	9,410	19,100
6	18,100	13,200	21,100	35,800	78,600	72,800	37,800	18,300	9,940	10,800	9,410	19,100
7	16,900	13,000	22,700	36,300	78,600	71,500	36,800	17,900	10,200	10,800	9,410	19,100
8	16,700	11,500	26,100	36,800	79,300	70,300	35,800	17,200	10,500	11,100	9,670	19,100
9	17,400	10,600	29,200	36,800	80,000	69,100	35,400	16,800	10,500	11,100	10,200	19,100
10	17,600	10,500	27,000	37,300	82,000	68,400	34,400	16,100	10,200	11,100	10,800	19,100
11	18,100	10,600	24,400	37,800	84,200	66,600	33,900	15,800	10,200	11,100	11,100	18,700
12	17,600	10,500	24,000	38,300	87,100	65,400	33,000	15,400	10,200	11,100	11,400	18,700
13	17,400	10,400	24,400	39,800	89,300	64,200	32,000	15,100	10,200	11,400	12,300	18,300
14	17,400	10,400	24,400	41,300	90,100	59,500	31,100	14,800	9,940	11,400	12,600	17,900
15	17,900	10,200	24,800	42,800	91,600	61,300	30,600	14,400	9,940	11,400	12,900	17,600
16	18,300	10,200	24,800	44,400	94,800	60,100	30,100	14,100	9,670	11,400	13,200	17,200
17	18,500	10,200	25,300	44,900	94,800	58,900	29,200	14,100	9,670	11,100	13,800	16,800
18	18,100	10,400	26,100	46,000	94,800	57,800	28,300	13,800	9,670	10,800	14,100	16,800
19	17,600	10,500	27,000	47,100	93,200	56,600	27,400	13,500	9,670	10,500	14,800	16,800
20	17,400	10,600	27,900	49,300	92,400	56,600	27,000	13,200	9,940	10,200	17,600	16,500
21	18,100	10,800	29,700	50,900	90,800	54,300	26,600	12,900	9,940	9,940	19,100	16,100
22	18,700	10,600	31,100	52,600	89,300	54,300	26,100	12,600	9,940	9,940	19,500	15,400
23	18,700	10,400	32,500	54,900	87,100	52,000	25,300	12,300	9,940	9,670	19,500	15,400
24	18,900	10,200	35,400	56,000	85,600	51,500	24,800	12,000	10,200	9,410	19,500	15,100
25	19,200	9,840	37,300	57,200	83,400	50,400	24,400	11,700	10,500	9,150	19,900	15,100
26	18,300	9,470	38,800	60,100	82,700	49,300	23,600	11,700	10,200	8,900	19,900	15,100
27	16,500	11,400	39,800	63,000	81,300	48,200	22,700	11,400	10,200	8,900	20,300	15,100
28	14,700	12,700	39,800	66,000	80,600	47,100	22,300	11,100	9,940	8,900	20,300	14,800
29	13,800	.....	39,300	69,100	80,000	46,000	21,900	11,100	9,670	8,900	19,900	14,400
30	14,000	.....	39,300	72,800	80,000	45,500	21,100	11,100	9,670	8,900	19,500	14,400
31	14,000	.....	38,800	.....	79,300	.....	20,300	10,800	.....	8,900	.....	14,400

NOTE.—Daily discharge determined from a well-defined rating curve.
Daily discharge January and February obtained from gage heights at Metaline by means of curve of relation between Newport and Metaline.

Monthly discharge of Clark Fork at Newport, Wash., for 1910.

[Drainage area, 24,000 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	20,000	13,800	17,300	0.721	0.83	1,060,000	B.
February	13,600	9,470	11,200	.467	.49	622,000	B.
March	39,800	11,400	27,500	1.15	1.33	1,690,000	A.
April	72,800	35,800	46,800	1.95	2.18	2,780,000	A.
May	94,800	75,300	84,500	3.52	4.06	5,200,000	A.
June	77,900	45,500	61,300	2.55	2.84	3,650,000	A.
July	44,400	20,300	30,700	1.28	1.48	1,890,000	A.
August	19,900	10,800	14,700	.612	.71	904,000	A.
September	10,500	9,670	10,000	.417	.47	595,000	A.
October	11,400	8,900	10,200	.425	.49	627,000	A.
November	20,300	8,900	14,200	.592	.66	845,000	A.
December	19,100	14,400	17,100	.712	.82	1,050,000	A.
The year	94,800	8,900	28,900	1.20	16.35	20,900,000	

CLARK FORK AT METALINE, WASH.

This station, which is located at the town of Metaline, was established November 4, 1908, by Ham, Yearsley & Ryrie, of Spokane, who have furnished the records to the Survey.

The gage is in two sections and is graduated in feet and tenths, one section from zero to 32 feet and the other from zero to −10 feet. Observations are taken twice daily.

Daily gage height, in feet, of Clark Fork at Metaline, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.9	−0.6	−1.1	10.8	19.2	19.8	12.0	2.8	−1.9
2	2.5	−1.8	− .6	10.7	19.8	19.8	11.8	2.5	−1.9
3	1.0	−1.8	− .5	10.4	20.0	19.8	11.6	2.3	−2.1
4	.0	−1.7	− .4	10.4	20.5	19.8	11.3	2.0	−2.2
5	.6	− .8	.0	10.3	20.5	19.6	10.8	1.8	.....
6	1.9	− .9	1.1	10.1	20.5	19.5	10.4	1.6	.....
7	1.2	−1.0	1.7	10.1	20.5	19.3	10.2	1.6	.....
8	1.1	−2.0	2.9	10.2	20.6	18.9	9.7	1.3	.....
9	1.5	−2.6	4.5	10.3	20.6	18.6	9.4	1.0	.....
10	1.6	−2.7	4.9	10.4	20.7	18.4	9.0	.9	.....
11	1.9	−2.6	4.9	10.5	20.7	18.2	8.9	.7	.....
12	1.6	−2.7	4.8	10.6	20.7	17.8	8.6	.5	.....
13	1.5	−2.8	4.8	10.7	20.5	17.5	8.2	.4	.....
14	1.5	−2.8	4.9	10.9	20.6	17.2	7.8	.2	.....
15	1.8	−2.9	5.0	11.5	20.8	17.0	7.5	− .1	.....
16	2.0	−2.9	5.1	11.9	20.5	16.6	7.0	− .2	.....
17	2.1	−2.9	5.5	12.4	20.5	16.4	7.0	− .3	.....
18	1.9	−2.8	5.9	12.7	20.3	15.9	6.2	− .5	.....
19	1.6	−2.7	5.9	12.9	20.3	15.3	6.1	− .6	.....
20	1.5	−2.6	6.4	13.4	20.1	15.5	5.9	− .7	.....
21	1.9	−2.5	6.9	13.7	20.0	15.3	5.7	− .9	.....
22	2.2	−2.6	7.4	14.0	19.9	14.9	4.5	−1.1	.....
23	2.2	−2.8	8.5	14.5	19.8	14.6	4.3	−1.2	.....
24	2.3	−2.9	8.9	15.3	19.8	14.3	4.9	−1.3	.....
25	2.5	−3.2	9.5	15.7	19.9	14.0	4.6	−1.4	.....
26	2.0	−3.5	10.3	16.5	19.9	13.9	4.3	−1.4	.....
27	1.0	−2.1	10.7	16.8	19.9	13.7	4.0	−1.5	.....
28	.0	−1.2	10.9	17.6	19.9	13.1	3.8	−1.7	.....
29	− .5	.....	10.9	18.0	19.9	13.3	3.5	−1.8	.....
30	− .4	.....	10.9	18.7	19.9	12.4	3.3	−1.9	.....
31	− .4	.....	10.8	.....	19.8	.....	2.9	−1.9	.....

NOTE.—No gage heights recorded Sept. 5 to Oct. 3 or Dec. 5 to 31. Gage heights Oct. 4 to Dec. 4 do not agree with those at Newport, and hence are not published.

LITTLE BLACKFOOT RIVER BASIN.

Little Blackfoot River rises in the Helena National Forest in T. 7 N., R. 7 W., flows northward for 20 miles and then west to its confluence with Clark Fork near Garrison, Mont.

The upper part of the basin is heavily forested; the lower half is more or less open, is not so heavily timbered, and is of more value for agriculture.

LITTLE BLACKFOOT RIVER NEAR ELLISTON, MONT.

The gaging station, which is located a few hundred feet below the Little Blackfoot ranger station, in the Helena National Forest, in

the SE. ¼ SE. ¼ sec. 30, T. 9 N., R. 6 W., near Elliston, Mont., was established September 29, 1910.

The drainage area at this point comprises 59 square miles.

The gage is a vertical staff and discharge measurements are made by wading near the gage.

The bed of the stream is composed of gravel and small rocks and the channel is probably permanent. The discharge of the stream during the winter months is seriously affected by ice.

Water is diverted above this station for irrigation; one ditch takes out approximately one-half mile above the ranger station and is carried past the measuring section; the water in the ditch is measured in order to determine the run-off from the drainage area.

The following discharge measurement was made by J. C. Beebe:

September 29, 1910: Width, 9 feet; area, 5.3 square feet; gage height, 1.12 feet; discharge, 3.9 second-feet.

Daily gage height, in feet, of Little Blackfoot River near Elliston, Mont., for 1910.

[M. D. Mizner, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		1.08	1.30	1.60	16			1.51	
2		1.19	1.30	1.57	17			1.51	
3		1.19	1.30	1.55	18			1.51	
4		1.19	1.24	1.52	19		1.20	1.51	
5		1.19	1.00	1.50	20		1.20	1.52	
6		1.21	1.50	1.50	21		1.15	1.52	
7		1.21	1.50	1.49	22		1.15	1.52	
8		1.21	1.50	1.49	23		1.29	1.53	
9			1.50		24		1.29	1.54	
10			1.51		25		1.29		
11			1.51		26		1.29	1.60	
12			1.51		27		1.30	1.60	
13			1.51		28		1.30	1.60	
14			1.51		29	1.12	1.30	1.60	
15			1.51		30	1.11	1.30	1.60	
					31		1.30		

LITTLE BLACKFOOT DITCH NEAR ELLISTON, MONT.

This station, which is located immediately below the highway bridge over the ditch near the Little Blackfoot ranger station, in the Helena National Forest, near Elliston, Mont., in the SE. ¼ SE. ¼ sec. 30, T. 9 N., R. 6 W., was established September 29, 1910.

The gage is a vertical staff in the ditch. The channel is composed of sand which shifts. Discharge measurements are made by wading.

The flow through the ditch is controlled by the headgates which carry no water during the winter months.

The following discharge measurement was made by J. C. Beebe:

September 29, 1910: Width, 6 feet; area, 4.5 square feet; gage height, 1.41 feet; discharge, 7.6 second-feet.

Daily gage height, in feet, of Little Blackfoot ditch near Elliston, Mont., for 1910.

[M. D. Mizner, observer.]

Day.	Sept.	Oct.	Nov.	Day.	Sept.	Oct.	Nov.	Day.	Sept.	Oct.	Nov.
1	.....	1.47	1.30	11	.....	.....	.....	21	.....	1.30	.....
2	.....	1.41	1.30	12	.....	.....	.....	22	.....	1.30	.....
3	.....	1.41	1.30	13	.....	.....	.....	23	.....	1.29	.....
4	.....	1.41	1.24	14	.....	.....	.....	24	.....	1.29	.....
5	.....	1.41	1.00	15	.....	.....	.....	25	.....	1.29	.....
6	.....	1.41	.....	16	.....	.....	.....	26	.....	1.29	.....
7	.....	1.41	.....	17	.....	.....	.....	27	.....	1.30	.....
8	.....	1.40	.....	18	.....	.....	.....	28	.....	1.30	.....
9	.....	.....	.....	19	.....	1.35	.....	29	1.41	1.30	.....
10	.....	.....	.....	20	.....	1.35	.....	30	1.42	1.31	.....
								31	.....	1.31	.....

ROCK CREEK BASIN.

GENERAL FEATURES.

Rock Creek rises in T. 2 N., R. 16 W., and flows northwestward to its junction with the Clark Fork below Bonita, Mont. Nearly the entire drainage area is in the Missoula National Forest and is mountainous and forested.

The flow of the stream is derived during the entire year from perennial springs and during the summer months from the melting snow on the mountains. This stream drains comparatively high ranges between the Bitterroot River, Flint Creek, and the Big Hole River. There are no appreciable tributaries for the lower 25 miles of its course. Above this point, Hogback Creek, Upper Willow Creek, Ross and Middle Fork are the principal tributaries.

A part of the flow of this stream is at present used in placer mining. There will eventually be power development at several places along its course.

ROCK CREEK NEAR QUIGLEY, MONT.

This station was established in the fall of 1910 and is maintained in cooperation with the United States Forest Service.

A staff gage is used.

The following discharge measurement was made by W. A. Lamb:

September 22, 1910: Width, 112 feet; area, 148 square feet; gage height, 1.30 feet; discharge, 295 second-feet.

Daily gage height, in feet, of Rock Creek near Quigley, Mont., for 1910.

[H. N. Morgan, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1				1.10	16		1.10		
2		1.10	1.20		17		1.10		
3				1.10	18				
4					19		1.10	1.30	
5		1.30	1.10		20				
6			1.10	1.10	21		1.20		
7		1.10			22	1.30			
8					23				
9		1.10			24				
10					25				
11					26			1.30	
12			1.50		27		1.10		
13		1.20			28			1.30	
14					29				
15			1.20		30				
					31				

BITTERROOT RIVER BASIN.

GENERAL FEATURES.

Bitterroot River is formed in the western part of T. 2 N., R. 20 W., by the junction of its East and West forks and flows northward 50 miles to Missoula, where it unites with Clark Fork.

The West Fork rises in T. 4 S., R. 22 W., and flows northeastward; the East Fork rises on the west slope of the Continental Divide, flows southwestward about 15 miles, then northwestward 8 miles to the point of junction with the West Fork. The area drained by these upper forks is mountainous and the streams are fed by melting snow and by perennial springs. The basins contain little arable land except along the immediate river bottoms.

Below the forks the Bitterroot occupies a more open valley and receives many short tributaries draining the bordering mountain slopes.

WEST FORK OF BITTERROOT RIVER NEAR DARBY, MONT.

This station, which is located in sec. 27, T. 2 N., R. 21 W., approximately 500 feet downstream from the ranger's station, one-half mile from the mouth of Trapper Creek, and 2 miles above the mouth of this fork of the Bitterroot, was established September 19, 1910.

The drainage area above this point is 572 square miles.

The gage is a staff fastened to a tree on the left bank.

The bed of the stream is composed of small bowlders and is probably permanent. The channel is comparatively uniform in cross section.

Discharge measurements are made by wading or from a cable.

Winter flow is affected by ice.

The following discharge measurement was made by W. A. Lamb:

September 19, 1910: Width, 92 feet; area, 128 square feet; gage height, 2.11 feet; discharge, 148 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of West Fork of Bitterroot River near Darby, Mont., for 1910.

[W. A. Kerlee, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.00	140	2.22	213	2.30	245
2	.....	.....	2.01	143	2.25	225	2.30	245
3	.....	.....	2.22	213	2.30	245	2.34	261
4	.....	.....	2.51	335	2.23	217	2.35	265
5	.....	.....	2.05	155	2.18	198	2.36	269
6	.....	.....	2.48	321	2.10	170	2.16	191
7	.....	.....	2.40	285	2.20	205	2.20	205
8	.....	.....	2.38	277	2.40	285	2.37	273
9	.....	.....	2.38	277	2.60	380	2.30	245
10	.....	.....	2.35	265	2.65	408	2.32	253
11	.....	.....	2.33	257	2.85	520	2.26	229
12	.....	.....	2.31	249	2.95	580	2.22	213
13	.....	.....	.....	249	.....	563	2.20	205
14	.....	.....	.....	247	.....	546	2.20	205
15	.....	.....	.....	245	.....	529	2.20	205
16	.....	.....	.....	243	.....	512	2.25	225
17	.....	.....	.....	241	.....	495	2.34	261
18	.....	.....	.....	239	.....	478	2.34	261
19	2.11	174	.....	237	.....	461	2.34	261
20	2.05	155	.....	235	.....	444	2.43	298
21	2.10	170	.....	233	.....	427	2.50	330
22	2.12	177	.....	231	.....	410	2.47	316
23	2.09	167	.....	229	.....	393	2.47	316
24	2.08	164	.....	227	.....	375	2.46	312
25	2.08	164	.....	225	.....	357	.....	307
26	2.05	155	.....	223	.....	339	.....	302
27	2.05	155	.....	221	.....	321	.....	298
28	2.06	158	.....	219	.....	303	2.42	294
29	2.01	143	.....	217	.....	285	2.39	281
30	2.00	140	.....	215	.....	267	2.35	265
31	.....	.....	.....	214	.....	.....	2.35	265

NOTE.—Daily discharge determined from a rating curve fairly well defined. Discharge interpolated for days on which gage was not read.

Monthly discharge of West Fork of Bitterroot River near Darby, Mont., for 1910.

[Drainage area, 572 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
September 19–30	177	140	160	0.280	0.12	3,810	B.
October	335	140	236	.413	.48	14,500	C.
November	580	170	372	.650	.73	22,100	C.
December	330	191	261	.456	.53	16,000	B.

EAST FORK OF BITTERROOT RIVER NEAR DARBY, MONT.

This station, which is located at Joe Olson's bridge in front of the Medicine Tree ranger station in SE. ¼ sec. 21, T. 2 N., R. 20 W., 10 miles from Darby, and 3 miles from the junction of the East and West Forks of the Bitterroot, was established October 20, 1910.

The drainage area above this point comprises 340 square miles. No important ditches take water from this fork.

The gage is a vertical staff fastened to the bridge abutment on the right bank.

The bed of the stream is composed of large cobble stones or bowlders, and is probably permanent.

Discharge measurements are made by wading or from the bridge.

The winter flow is seriously affected by ice.

The accuracy of the records is rated as fair.

The following discharge measurement was made by W. A. Lamb:

September 20, 1910: Width, 50 feet; area, 66 square feet; gage height, 2.20 feet; discharge, 84 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of East Fork of Bitterroot River near Darby, Mont., for 1910.

[J. D. Vance, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	.....	94	2.30	104	.....	115
2	.....	.....	2.30	104	2.30	104	.....	113
3	.....	.....	2.40	124	2.35	114	.....	111
4	.....	.....	2.60	166	2.30	104	.....	109
5	.....	.....	2.40	124	2.25	94	.....	107
6	.....	.....	2.40	124	2.25	94	.....	105
7	.....	.....	2.35	114	2.25	94	2.30	104
8	.....	.....	2.35	114	2.40	124	2.20	84
9	.....	.....	2.30	104	2.40	124	2.30	104
10	.....	.....	2.28	100	2.40	124	2.00	50
11	.....	.....	2.25	94	2.50	145	2.00	50
12	.....	.....	2.25	94	2.60	166	.....	59
13	.....	.....	2.30	104	.....	135	.....	68
14	.....	.....	2.35	114	2.30	104	.....	77
15	.....	.....	2.30	104	2.30	104	.....	86
16	.....	.....	2.25	94	2.10	66	.....	95
17	.....	.....	2.20	84	2.10	66	.....	104
18	.....	.....	2.30	104	2.10	66	.....	114
19	.....	.....	2.30	104	.....	85	2.40	124
20	2.20	84	2.25	94	2.30	104	.....	124
21	.....	89	2.25	94	2.35	114	.....	124
22	.....	94	2.25	94	2.40	124	2.40	124
23	.....	99	2.25	94	2.40	124	.....	126
24	2.30	104	2.25	94	.....	123	.....	128
25	.....	101	2.25	94	.....	122	.....	130
26	.....	98	2.35	114	.....	121	.....	132
27	.....	95	2.30	104	.....	120	2.45	134
28	.....	92	2.20	84	.....	119	2.50	145
29	.....	88	.....	89	.....	118	.....	145
30	2.20	84	2.25	94	.....	117	2.50	145
31	.....	.....	2.28	100	.....	.....	2.40	124

NOTE.—Daily discharge determined from a fairly well defined rating curve. Discharge interpolated for days on which gage was not read.

Monthly discharge of East Fork of Bitterroot River near Darby, Mont., for 1910.

[Drainage area, 340 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
September 20-30	104	84	93.5	0.275	0.12	2,040	C.
October	166	84	104	.306	.35	6,400	B.
November	166	66	111	.326	.36	6,600	B.
December	145	50	108	.318	.37	6,640	C.

LOLO CREEK NEAR LOLO, MONT.

Lolo Creek rises in the Missoula National Forest in T. 11 N., R. 24 W., and flows eastward to its junction with Bitterroot River near Lolo, Mont.

The flow of the stream is derived during the spring and early summer from melting snow, and during the remainder of the year from perennial springs. The chief tributary is the South Fork, which joins the creek 8 miles above its mouth.

The gaging station, which is located in sec. 35, T. 12 N., R. 21 W., 1 mile below Anderson's ranch, was established October 18, 1910. Several small ditches take water from this stream above the station for irrigation on the ranches. Below the station all the normal flow is diverted for irrigation of land along the creek and Bitterroot River.

The drainage area above this station comprises 249 square miles.

The gage is a vertical staff fastended to the bridge abutment of the left bank.

The channel is composed of gravel and small rocks and is probably permanent.

Discharge measurements are made by wading or from the bridge.

The winter flow is affected by ice.

Discharge measurements of Lolo Creek near Lolo, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 18	J. C. Beebe	46	52	2.21	90
Dec. 20	E. W. Kramer	31	34	2.11	74

Gage heights, in feet, of Lolo Creek near Lolo, Mont., for 1910.

Oct. 18	2.20
Oct. 29	2.13
Oct. 31	2.22
Nov. 1	2.25
Nov. 3	2.20
Nov. 5	2.15
Dec. 30	2.10
Dec. 31	2.10

ST. REGIS RIVER BASIN.

GENERAL FEATURES.

St. Regis River rises in the Lolo National Forest near the Montana-Idaho boundary line, in T. 19 N., R. 32 W., and flows southeastward to its junction with Clark Fork at St. Regis, Mont., in T. 18 N., R. 28 W.

The basin is narrow, mountainous, and forested, and the flow of the stream is derived from melting snow.

The basin contains little agricultural land with the exception of the small flat near St. Regis, and this tract is irrigated from another creek that passes through it.

ST. REGIS RIVER AT ST. REGIS, MONT.

This gaging station, which is located in the NE. ¼ sec. 28, T. 18 N., R. 28 W., below the suspension bridge at the St. Regis ranger station, approximately 3 miles from the town of St. Regis, and the junction of the river with Clark Fork, was established September 10, 1910.

The gage is a vertical staff attached to a tree on the left bank of the stream about 100 feet below the bridge.

The bed of the stream is composed of rocks and is fairly uniform at the gage and is probably permanent. There is but one channel at all stages. At low water the river is shallow and velocity fairly high.

Discharge measurements are made by wading below the bridge or, during the high or medium stages, from the bridge.

The winter flow is seriously affected by ice.

The records derived from observations at this station are fair.

The following discharge measurement was made by W. A. Lamb:

September 17, 1910: Width, 76 feet; area, 56 square feet; gage height, 1.85 feet; discharge, 121 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of St. Regis River at St. Regis, Mont., for 1910.

[S. C. Armitage and O. L. Beal, observers.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	120	1.80	130	1.85	142	2.50	350
2	.....	120	1.84	140	1.85	142	.....	350
3	.....	120	2.30	275	2.12	216	.....	350
4	.....	120	2.80	485	2.38	303	.....	350
5	.....	120	2.45	330	1.92	160	.....	350
6	.....	120	2.30	275	1.90	155	.....	350
7	.....	120	2.21	244	2.40	310	.....	350
8	.....	120	2.16	228	3.25	758	.....	350
9	.....	120	2.70	435	2.65	412	.....	350
10	.....	120	1.96	170	2.90	540	.....	350
11	.....	120	2.02	186	3.25	758	2.50	350
12	.....	120	2.00	180	3.60	1,000	2.25	258
13	.....	120	1.98	175	2.25	258	2.00	180
14	.....	120	1.95	168	1.92	160	1.90	155
15	.....	120	1.95	168	1.65	92	1.90	155
16	.....	120	1.95	168	1.90	155	1.70	105
17	1.85	142	.....	162	2.25	258	1.80	130
18	1.85	142	.....	157	2.25	258	1.70	105
19	1.80	130	.....	151	3.25	758	.....	100
20	1.80	130	.....	145	3.12	673	.....	100
21	1.85	142	.....	140	3.00	600	.....	100
22	1.86	145	.....	135	3.40	860	.....	100
23	1.81	132	1.80	130	3.00	600	.....	100
24	1.80	130	1.80	130	2.90	540	.....	100
25	1.81	132	1.80	130	2.60	390	.....	100
26	1.81	132	2.00	180	2.90	540	.....	100
27	1.80	130	2.38	303	3.00	600	.....	100
28	1.80	130	2.50	350	3.00	600	.....	100
29	1.80	130	2.25	258	3.00	600	.....	100
30	1.80	130	2.10	210	2.75	460	.....	100
31	.....	.....	2.00	180	.....	.....	.....	100

NOTE.—Daily discharge determined from a rating curve fairly well defined. Discharge interpolated for days on which gage was not read.

Monthly discharge of St. Regis River at St. Regis, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
September	145	120	127	7,560	C.
October	485	130	210	12,900	B.
November	1,000	92	443	26,400	B.
December	350	100	201	12,400	C.

FLATHEAD RIVER BASIN.

GENERAL FEATURES.

Flathead River rises on the western slope of the Continental Divide in the southeastern part of British Columbia, and takes a general southerly course, passing through Flathead Lake, to Dixon, Mont., where it turns abruptly and flows westward to its junction with Clark Fork about 3 miles southeast of Paradise. It is a large stream with many important tributaries, a few of which (those on which gaging stations have been maintained) are briefly described in the following paragraphs:

Above the lake the principal tributaries are the Middle, North, and South forks. The Middle and South forks rise in the Rocky Mountains in the Lewis and Clark National Forest, and flow northwestward, the Middle Fork uniting with the North Fork, about 6 miles southwest of Belton and the South Fork entering near Columbia Falls. The drainage areas of these forks are long and narrow and very mountainous, but from Columbia Falls to the lake the valley is broad and fertile and the stream sluggish. The principal tributary that enters between Columbia Falls and the lake is Stillwater River.

Swan River, which enters the Flathead in Flathead Lake, rises between the Mission and Flathead ranges and the Rocky Mountains in T. 17 N., R. 17 W., and flows northwestward to its mouth near Big Fork, Mont. The basin is long and narrow, mountainous and forested, and contains but little arable land. A number of lakes near the headwaters and a comparatively large lake near the mouth of the stream tend to equalize the flow. Near the mouth of the river at Big Fork is the plant of the Northern Idaho & Montana Power Co., which develops power for the city of Kalispell.

Below Flathead Lake the first important tributary of the river is Little Bitterroot Creek, which rises in Little Bitterroot Lake near Marion, Mont., and flows southeastward to its junction with the Flathead 12 miles north of Dixon. It is about 50 miles long, has many small tributaries, and drains an area comprising about 600 square miles. Near Hubbart the creek has a sheer fall of about 50 feet and is bounded by high cliffs. Several reservoir sites have been surveyed on the upper part of the stream.

Three miles below the mouth of Little Bitterroot Creek the Flathead is joined by Crow Creek, a small stream rising in the eastern part of the Flathead Indian Reservation and flowing southwestward.

Eight miles below the mouth of Crow Creek, Mission Creek enters the Flathead. This creek rises on the western slope of Mission Range and takes a general northwesterly course. Its principal tributary is Post Creek, the outlet of Lake McDonald. Dry Creek, on which a gaging station is maintained, enters Mission Creek a few miles above St. Ignatius.

The only other important tributary of the Flathead is Jocko River, which rises in the eastern part of the Flathead Indian Reservation and flows northwestward into the Flathead near Dixon. Tributaries of Jocko River on which stations have been maintained are Big Knife, Agency, Finley, and Valley creeks.

The Flathead is not subject to sudden fluctuations in volume, as its flow is regulated by the lake. This body of water is about 20 miles long and 15 miles in maximum width. It is 2,916 feet above sea level (Land Office map, 1907) and contains a number of islands.

NORTH FORK OF FLATHEAD RIVER NEAR COLUMBIA FALLS, MONT.

This station, which is located at Potter's ranch, about 10 miles northeast of Columbia Falls, three-fourths mile above the junction of the stream with the Middle Fork of the Flathead, was established September 22, 1910.

The drainage area above this point comprises 1,620 square miles.

The gage is a staff fastened to a log pier on the right bank.

The bed of the stream is rocky, clean, and nonshifting.

Discharge measurements are made from a cable about three-fourths mile above the gage.

Discharge measurements of North Fork of Flathead River near Columbia Falls, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 22	C. S. Heidel	245	586	1.60	965
Oct. 13	W. A. Lamb	255	922	2.94	2,540
Nov. 26	B. E. Jones	255	775	2.51	1,900

Daily gage height, in feet, and discharge, in second-feet, of North Fork of Flathead River near Columbia Falls, Mont., for 1910.

[J. F. Potter, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.0	1,300	2.45	1,820	2.2	1,510
2			2.35	1,690	2.4	1,750	2.15	1,460
3			2.65	2,090	2.3	1,630	2.15	1,460
4			2.9	2,470	2.25	1,570	2.15	1,460
5			2.6	2,020	2.2	1,510	2.05	1,350
6			2.5	1,880	2.1	1,400	2.05	1,350
7			2.8	2,310	2.15	1,460	2.0	1,300
8			3.6	3,890	2.5	1,880	2.0	1,300
9			3.5	3,650	2.4	1,750	2.0	1,300
10			3.45	3,540	2.5	1,880	1.85	1,160
11			3.3	3,210	3.65	4,020	1.7	1,030
12			3.1	2,820	4.15	5,400	1.7	1,030
13			2.9	2,470	3.8	4,400	1.8	1,110
14			2.75	2,240	3.5	3,650	1.7	1,030
15			2.6	2,020	3.2	3,010	1.65	990
16			2.5	1,880	3.05	2,730	1.65	990
17			2.5	1,880	2.9	2,470	1.8	1,110
18			2.5	1,880	2.85	2,390	1.7	1,030
19			2.4	1,750	2.7	2,170	1.6	950
20			2.35	1,690	2.7	2,170	1.8	1,110
21			2.25	1,570	2.9	2,470	1.6	950
22	1.6	950	2.2	1,510	3.0	2,640	1.6	950
23	1.6	950	2.15	1,460	2.85	2,390	1.7	1,030
24	1.7	1,030	2.1	1,400	2.7	2,160	1.7	1,030
25	1.7	1,030	2.5	1,880	2.6	2,020	1.7	1,030
26	1.6	950	3.25	3,110	2.5	1,880	1.7	1,030
27	1.6	950	3.0	2,640	2.4	1,750	1.65	990
28	1.55	925	2.8	2,310	2.3	1,630	1.6	950
29	1.6	950	2.7	2,160	2.3	1,630	1.6	950
30	1.7	1,030	2.65	2,090	2.25	1,570	1.6	950
31			2.55	1,950			1.6	950

NOTE.—Daily discharge determined from a rating curve fairly well defined below 3,010 second-feet.

Monthly discharge of North Fork of Flathead River near Columbia Falls, Mont., for 1910.

[Drainage area, 1,620 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
September 22-30	1,030	925	974	0.601	0.21	17,400	B.
October	3,890	1,300	2,220	1.37	1.58	136,000	B.
November	5,400	1,400	2,310	1.43	1.60	137,000	B.
December	1,510	950	1,120	.691	.80	68,900	B.

FLATHEAD RIVER ABOVE FLATHEAD LAKE, MONT.

In order to determine the relative height and slope of Flathead River above Flathead Lake at different stages three gages were established April 24, 1909.

The upper gage is located across the river from the steamboat landing at Demersville, Mont., 3 miles below Kalispel, Mont. The second gage is located near the ranch buildings of F. N. Damon, 10 miles below Kalispel and 7 miles below Demersville. The third is at Keller's ranch, 1 mile above Holt, 16 miles below Kalispel and about 6 miles above the point where it enters Flathead Lake. As the current at these gages is sluggish, the river freezes entirely over during the winter months.

Daily gage height, in feet, of Flathead River at Demersville, near Kalispel, Mont., for 1910.

[S. V. Shull, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Dec.
1	.....	82.6	91.0	91.8	85.3	81.6	80.3	79.6	81.3
2	.....	82.5	91.0	91.6	85.0	81.5	80.3	79.7	81.3
3	.....	82.6	89.3	91.0	84.9	81.5	80.3	79.8	81.2
4	.....	82.6	89.7	90.1	84.8	81.4	80.4	80.2	81.2
5	.....	82.5	89.0	89.4	84.7	81.2	80.5	80.7	81.1
6	.....	82.6	89.6	89.0	84.5	81.0	80.4	80.6	81.2
7	.....	82.8	90.7	89.3	84.3	80.9	80.3	81.3	81.1
8	.....	83.8	92.3	89.9	84.0	80.9	80.2	81.0	81.0
9	.....	83.4	93.6	89.1	83.9	80.9	80.1	81.5	81.5
10	.....	83.3	94.0	88.7	83.8	80.8	80.0	82.5	82.2
11	.....	85.0	94.5	88.5	83.7	80.8	80.0	82.5	82.8
12	.....	86.6	93.5	88.2	83.5	80.9	79.9	82.3	83.0
13	.....	87.5	92.4	89.3	83.2	80.9	79.9	82.2	.....
14	.....	87.0	92.0	88.8	82.9	80.9	79.8	82.1	.....
15	.....	85.5	92.0	88.6	82.8	80.8	79.8	82.0	.....
16	.....	85.0	91.3	88.4	82.7	80.8	79.8	81.9	.....
17	.....	85.8	90.8	88.5	82.7	80.7	79.8	81.5	.....
18	.....	86.0	90.3	88.3	82.8	80.7	79.7	81.2	.....
19	.....	86.5	90.2	88.0	82.7	80.6	79.7	80.9	.....
20	.....	88.0	90.3	87.6	82.6	80.7	79.7	80.8	.....
21	.....	89.7	90.2	87.4	82.5	80.7	79.7	80.7	.....
22	.....	89.6	89.7	87.0	82.4	80.6	79.6	80.7	.....
23	.....	89.0	90.7	86.8	82.4	80.6	79.6	80.7	.....
24	.....	88.9	90.3	86.5	82.3	80.5	79.6	80.6	.....
25	.....	90.0	91.7	86.2	82.2	80.5	79.6	80.7	.....
26	.....	91.9	92.5	86.0	82.1	80.4	79.7	81.1	.....
27	83.3	93.5	92.0	86.7	81.9	80.4	79.7	81.8	.....
28	83.3	94.5	90.5	85.9	81.8	80.3	79.6	81.5	.....
29	82.9	93.5	90.8	85.7	81.7	80.3	79.6	81.4	.....
30	82.7	93.5	90.7	85.5	81.6	80.4	79.6	81.4	.....
31	82.6	.....	90.8	.....	81.6	80.3	.....	81.3	.....

NOTE.—To obtain elevation above mean sea level, add 2,800 feet to all gage heights.

Daily gage height, in feet, of Flathead River at Damon's ranch, near Kalispel, Mont., for 1910.

[Fred N. Damon, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	82.1	88.9	89.3	84.8	81.5	80.05	79.6	80.9
2	.....	82.1	88.5	89.5	84.6	81.45	80.0	79.6	80.85
3	.....	82.2	88.1	89.2	84.4	81.3	80.05	79.85	80.8
4	.....	82.2	87.9	88.7	84.4	81.2	80.1	79.95	80.8
5	.....	82.1	87.8	88.2	84.25	81.2	80.1	80.1	80.75
6	.....	82.1	87.9	88.0	84.05	81.15	80.05	80.05	80.8
7	.....	82.2	88.5	88.0	83.9	81.1	79.95	80.0	80.75
8	.....	82.2	89.5	88.0	83.8	81.1	79.95	80.3	80.8
9	.....	82.6	90.2	87.8	83.6	81.0	79.9	80.7	81.0
10	.....	83.0	90.6	87.6	83.5	80.9	79.9	80.75	81.2
11	.....	83.5	91.0	87.4	83.4	80.85	79.85	80.75	81.2
12	.....	83.9	90.8	87.6	83.25	80.8	79.8	80.7	82.4
13	.....	84.6	90.3	87.7	83.1	80.75	79.8	80.65	.....
14	.....	84.9	90.1	87.4	83.0	80.7	79.75	80.7	.....
15	.....	84.7	90.1	87.2	82.9	80.7	79.75	80.6	.....
16	.....	84.5	89.7	87.2	82.8	80.65	79.75	80.55	.....
17	.....	84.4	89.3	87.2	82.75	80.6	79.7	80.6	.....
18	.....	84.5	89.5	87.15	82.7	80.6	79.7	80.6	.....
19	.....	84.8	88.9	86.8	82.6	80.55	79.7	80.6	.....
20	81.1	85.7	89.0	86.6	82.45	80.5	79.65	80.6	.....
21	81.3	86.9	88.7	86.4	82.4	80.45	79.7	80.55	.....
22	81.6	87.0	88.4	86.3	82.4	80.4	79.7	80.5	.....
23	82.3	86.8	88.4	86.0	82.3	80.35	79.65	80.5	.....
24	82.7	86.7	88.8	85.8	82.15	80.3	79.6	80.5	.....
25	82.5	87.3	89.4	85.6	82.0	80.25	76.6	80.6	.....
26	82.2	88.6	89.9	85.4	81.95	80.1	79.55	80.7	.....
27	82.1	89.7	89.9	85.3	81.8	80.1	79.55	81.0	.....
28	82.1	90.5	89.55	85.3	81.7	80.1	79.55	81.0	.....
29	82.1	90.2	89.1	85.5	81.65	80.1	79.55	80.9	.....
30	82.0	89.5	89.0	84.9	81.6	80.1	79.6	80.9	.....
31	82.0	.....	89.5	.....	81.5	80.1	.....	80.9	.....

NOTE.—To obtain elevation above mean sea level, add 2,800 feet to all gage heights.

Daily gage height, in feet, of Flathead River at Keller's ranch, near Holt, Mont., for 1910.

[Ben Keller, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	81.9	87.45	87.9	84.6	81.35	80.3	.....	80.8
2	.....	81.9	87.35	88.0	84.5	81.3	80.3	79.85	80.8
3	.....	81.95	87.25	87.9	84.4	81.25	80.25	79.85	80.85
4	.....	81.95	87.1	87.8	84.3	81.2	80.25	79.9	80.85
5	.....	81.95	86.95	87.6	84.2	81.15	80.2	79.95	80.85
6	.....	82.0	86.95	87.4	84.1	81.1	80.2	80.0	80.85
7	.....	82.0	87.1	87.2	84.0	81.1	80.15	80.05	80.85
8	.....	82.05	87.3	87.1	83.9	81.05	80.15	80.1	80.9
9	.....	82.1	87.9	87.0	83.8	81.05	80.1	80.15	80.9
10	.....	82.0	88.1	86.8	83.6	80.9	80.0	80.1	80.85
11	.....	82.6	88.5	86.8	83.6	81.0	80.05	80.25	81.0
12	.....	82.9	88.6	86.7	83.5	80.9	80.05	80.3	81.05
13	.....	83.2	88.6	86.6	83.4	80.9	80.0	80.35	81.4
14	.....	83.4	88.65	86.5	83.3	80.8	80.0	80.4	81.6
15	.....	83.6	88.65	86.4	83.2	80.8	79.95	80.45	81.65
16	.....	83.65	88.6	86.3	83.1	80.75	79.95	80.5	81.65
17	.....	83.7	88.4	86.25	83.0	80.75	79.9	80.55	81.65
18	.....	83.75	88.2	86.2	82.9	80.7	79.9	80.6	81.6
19	.....	83.9	88.0	86.15	82.8	80.7	79.85	80.6	81.6
20	80.35	84.2	87.8	86.0	82.6	80.55	79.75	80.5	81.5
21	80.45	84.7	87.8	86.05	82.6	80.65	79.8	80.65	81.6
22	80.6	85.1	87.7	86.0	82.5	80.6	79.8	80.65	81.6
23	80.9	85.2	87.6	85.9	82.35	80.6	79.75	80.65	81.55
24	81.3	85.4	87.6	85.8	82.25	80.55	79.75	80.6	81.55
25	81.5	85.7	87.8	85.6	82.15	80.55	79.7	80.6	81.55
26	81.65	86.4	88.05	85.4	82.0	80.5	79.7	80.6	81.55
27	81.7	86.9	88.1	85.2	81.85	80.5	79.7	80.65	.....
28	81.75	87.3	88.1	85.0	81.7	80.45	79.75	80.65	.....
29	81.8	87.45	88.0	84.8	81.55	80.4	79.75	80.7	.....
30	81.75	87.45	87.8	84.6	81.3	80.25	79.7	80.65	.....
31	81.9	.....	87.8	.....	81.4	80.35	.....	80.8	.....

NOTE.—To obtain elevation above mean sea level, add 2,800 feet to all gage heights.

FLATHEAD LAKE AT POLSON, MONT.

This station, which is located at the steamboat dock at the town of Polson, Mont., was established August 23, 1908. Polson is at the southern extremity of the lake, 35 miles north of Ravalli, on the Northern Pacific Railway, and about the same distance south of Kalispel.

The records show the fluctuation of the lake at different periods of the year and are of value in connection with the irrigating of the Flathead Indian Reservation. The gage is of the ordinary staff type reading from 77 to 94 feet. It is nailed to the middle piling at the extreme end of the steamboat pier. Gage datum is 2,800 feet above sea level.

Daily gage height, in feet, of Flathead Lake at Polson, Mont., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	79.6	81.4	86.9	87.4	84.2	81.3	80.0	79.6	80.6	81.4
2	.....	.....	79.5	81.5	86.9	87.3	84.1	81.2	80.1	79.6	80.6	81.4
3	.....	.....	79.5	81.6	86.8	87.5	84.0	81.2	80.0	79.6	80.6	81.4
4	.....	.....	79.6	81.6	86.5	87.4	83.8	81.3	80.0	79.6	80.6	81.4
5	.....	.....	79.6	81.7	86.5	87.1	83.6	81.2	80.0	79.6	80.6	81.4
6	.....	.....	79.7	81.8	86.4	86.9	83.5	81.1	80.0	79.7	80.6	81.3
7	.....	.....	79.6	81.7	86.5	86.8	83.4	81.0	80.0	79.7	80.6	81.2
8	.....	.....	79.6	81.7	86.6	86.6	83.3	80.9	80.0	79.8	80.7	81.2
9	.....	.....	79.7	81.8	86.9	86.5	83.2	80.8	80.0	79.9	80.7	81.1
10	.....	.....	79.7	81.9	87.2	86.3	83.2	80.9	79.9	80.0	80.7	81.1
11	.....	79.7	79.7	82.1	87.4	86.2	83.1	80.9	79.9	80.1	80.7	81.1
12	.....	.....	79.7	82.2	87.8	86.0	83.0	80.7	79.8	80.1	80.7	81.0
13	.....	79.7	79.7	82.4	87.8	86.0	82.8	80.7	79.8	80.2	81.0	81.0
14	.....	80.0	79.7	82.7	87.9	85.9	82.7	80.7	79.8	80.2	81.1	80.9
15	.....	.....	79.8	82.8	88.0	85.8	82.6	80.7	79.8	80.2	81.3	80.9
16	.....	.....	79.8	83.0	87.9	85.9	82.5	80.6	79.7	80.3	81.3	80.8
17	.....	.....	79.8	83.1	87.8	85.8	82.4	80.6	79.7	80.3	81.3	80.8
18	79.8	.....	79.9	83.2	87.7	85.8	82.3	80.5	79.6	80.4	81.3	80.7
19	.....	.....	80.0	83.3	87.5	85.7	82.3	80.5	79.6	80.4	81.4	80.6
20	.....	.....	80.0	83.4	87.4	85.7	82.2	80.4	79.7	80.4	81.4	60.6
21	.....	.....	80.2	83.8	87.4	85.5	82.2	80.4	79.7	80.4	81.4	80.6
22	.....	.....	80.3	84.1	87.3	85.4	82.1	80.3	79.7	80.4	81.4	80.5
23	.....	.....	80.4	84.4	87.2	85.2	82.0	80.2	79.6	80.4	81.4	80.5
24	.....	79.6	80.7	84.4	87.0	85.1	81.9	80.2	79.6	80.3	81.4	80.5
25	.....	79.5	81.0	84.6	87.0	85.0	81.8	80.1	79.6	80.3	81.5	80.4
26	79.8	79.6	81.2	84.9	86.9	84.9	81.7	80.1	79.6	80.3	81.6	80.4
27	.....	79.5	81.2	85.3	87.0	84.8	81.6	80.1	79.6	80.4	81.5	80.4
28	.....	79.5	81.4	85.9	87.2	84.7	81.6	80.1	79.6	80.5	81.5	80.3
29	.....	.....	81.4	86.3	87.3	84.5	81.6	80.0	79.6	80.5	81.5	80.3
30	79.7	.....	81.4	86.8	87.3	84.3	81.5	80.0	79.6	80.5	81.5	80.3
31	.....	.....	81.5	.....	87.4	.....	81.4	80.0	.....	80.5	.....	80.3

NOTE.—Add 2,800 to all gage heights to obtain elevation above mean sea level.

FLATHEAD RIVER BELOW POLSON, MONT.

This station, which is located at Mishell's ferry, 8 miles below Polson, Mont., was established July 23, 1907.

In the vicinity of the station the river falls 240 feet in 6 miles. In 1910 the mean discharge was 2,300 second-feet, and as it is possible to equalize the flow an enormous amount of power can be developed. At the Newell dam site, located by the United States Reclamation

Service, the stream flows from a narrow canyon whose bounding cliffs reach a great height. It is proposed to utilize the power for a pumping plant to irrigate lands on the Flathead Indian Reservation.

No diversion canals are taken from the river.

A chain gage is fastened to the right bank just above the ferry, its datum has not been changed since the station was first established.

Discharge measurements are made from a car on the ferry cable.

The flow at the station is little affected by ice and, as the channel does not change appreciably, the records derived from the observations are excellent.

Discharge measurements of Flathead River below Polson, Mont., 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 13	Raymond Richards	430	3,680	6.21	12,600
May 28[a]	W. A. Lamb	470	5,890	11.04	39,000
Aug. 2	do	435	3,250	4.96	8,570
Oct 5	Raymond Richards	395	2,170	2.48	3,900

[a] Soundings on this date computed from former measurement and standard section.

Daily gage height, in feet, of Flathead River below Polson, Mont., for 1910.

[Pete Mishell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.40	2.70	2.55	5.40	10.45	11.00	8.20	.....	3.00	2.37	3.85	5.10
2	2.40	.....	2.45	5.50	10.50	11.00	8.10	4.92	3.00	2.37	3.90	5.10
3	4.40	.....	.....	5.50	10.55	11.00	8.00	4.80	3.00	2.40	3.90	5.10
4	4.30	.....	.....	5.45	10.35	10.80	7.90	4.70	3.00	2.42	3.90	5.10
5	.....	2.70	2.75	5.35	10.20	10.75	7.80	4.60	3.10	2.52	3.95	5.10
6	.....	.....	.....	5.40	10.25	10.55	7.70	4.60	3.00	2.60	4.00	5.00
7	.....	.....	.....	5.60	10.20	10.50	7.50	4.40	3.05	2.70	4.00	5.00
8	.....	.....	.....	5.70	10.20	10.40	7.40	4.45	3.05	2.80	4.00	4.90
9	3.40	.....	2.75	5.80	10.50	10.30	7.20	4.30	3.05	2.90	4.05	4.80
10	.....	.....	2.65	5.80	10.85	10.20	.....	4.30	3.15	3.00	4.10	4.75
11	.....	.....	.....	6.00	11.12	10.10	.....	4.20	3.08	3.10	4.20	4.75
12	.....	2.70	2.75	6.15	11.25	9.95	.....	4.20	3.08	3.20	4.35	4.72
13	3.20	.....	2.75	6.30	11.30	9.80	.....	4.20	3.02	3.30	4.40	4.60
14	.....	.....	2.80	6.50	11.45	9.70	.....	4.30	2.90	3.40	4.58	4.60
15	3.10	.....	2.80	6.80	11.55	9.75	.....	4.30	3.00	3.50	4.90	4.50
16	.....	2.70	2.80	7.00	11.55	9.75	.....	4.02	2.80	3.62	5.00	4.50
17	.....	.....	2.85	7.10	11.35	9.50	.....	4.00	2.80	3.62	5.10	4.40
18	3.10	2.45	2.85	7.15	11.25	9.65	.....	4.05	2.70	3.62	5.15	4.40
19	.....	2.55	2.90	7.25	11.20	9.65	.....	4.05	2.70	3.62	5.18	4.30
20	.....	.....	2.90	7.40	11.15	9.50	.....	4.00	2.70	3.65	5.20	4.20
21	.....	.....	3.20	7.60	10.75	9.40	.....	3.90	2.60	3.65	5.20	4.10
22	3.00	.....	3.60	7.80	10.70	9.30	.....	3.80	2.62	3.65	5.20	4.00
23	3.00	.....	3.80	8.15	10.60	9.20	.....	3.70	2.68	3.70	5.20	3.90
24	.....	.....	4.00	8.30	10.65	9.00	.....	3.60	2.50	3.72	5.20	3.80
25	2.95	2.55	4.20	8.58	10.60	8.95	.....	3.60	2.65	3.72	5.20	3.70
26	.....	2.45	4.70	9.00	10.80	8.80	.....	3.40	2.45	3.75	5.20	3.60
27	.....	.....	4.80	9.65	11.00	8.70	.....	3.35	2.45	3.80	5.25	3.50
28	.....	2.55	4.90	.....	11.00	8.60	.....	3.20	2.48	3.80	5.10	3.62
29	2.95	.....	5.00	9.95	11.00	8.50	.....	3.10	2.30	3.82	5.10	3.50
30	.....	.....	5.10	10.35	11.00	8.40	.....	3.25	2.40	3.82	5.10	3.55
31	2.70	.....	5.30	.....	11.00	.....	.....	3.15	.....	3.85	.....	3.55

Daily discharge, in second-feet, of Flathead River below Polson, Mont., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7,100	4,120	3,940	9,960	35,300	38,900	22,000	8,740	4,500	3,720	5,900	9,000
2	7,100	4,120	3,820	10,300	35,700	38,900	21,400	8,470	4,500	3,720	6,000	9,000
3	7,100	4,120	4,000	10,300	36,000	38,900	20,900	8,130	4,500	3,760	6,000	9,000
4	6,860	4,120	4,000	10,100	34,700	37,600	20,400	7,860	4,500	3,780	6,000	9,000
5	6,380	4,120	4,180	9,800	33,800	37,300	19,800	7,600	4,640	3,900	6,100	9,000
6	5,900	4,120	4,180	9,960	34,100	36,000	19,300	7,600	4,500	4,000	6,200	8,700
7	5,900	4,120	4,180	10,600	33,800	35,700	18,400	7,100	4,570	4,120	6,200	8,700
8	5,500	4,120	4 180	11,000	33,800	35,000	17,900	7,220	4,570	4,240	6,200	8,410
9	5,110	4,120	4,180	11,400	35,700	34,400	17,000	6,860	4,570	4,370	6,300	8,130
10	4,950	4,120	4,060	11,400	38,000	33,800	16,700	6,860	4,720	4,500	6,410	8,000
11	4,950	4,120	4,120	12,100	39,700	33,100	16,400	6,630	4,610	4,640	6,630	8,000
12	4,950	4,120	4,180	12,700	40,600	32,200	16,100	6,630	4,610	4,790	6,980	7,910
13	4,790	4,120	4,180	13,300	41,000	31,300	15,800	6,630	4,530	4,950	7,100	7,600
14	4,720	4,120	4,240	14,100	42,000	30,600	15,500	6,860	4,370	5,110	7,550	7,600
15	4,640	4,120	4,240	15,300	42,800	31,000	15,200	6,860	4,500	5,280	8,410	7,350
16	4,640	4,120	4,240	16,100	42,800	31,000	14,900	6,240	4,240	5,490	8,700	7,350
17	4,640	3,970	4,300	16,500	41,300	29,400	14,600	6,200	4,240	5,490	9,000	7,100
18	4,640	3,820	4,300	16,700	40,600	30,300	14,300	6,300	4,120	5,490	9,160	7,100
19	4,570	3,940	4,370	17,200	40,200	30,300	14,000	6,300	4,120	5,490	9,250	6,860
20	4,570	3,940	4,370	17,900	39,900	29,400	13,700	6,200	4,120	5,540	9,310	6,630
21	4,570	3,940	4,790	18,800	37,300	28,800	13,400	6,000	4,000	5,540	9,310	6,410
22	4,500	3,940	5,450	19,800	37,000	28,200	13,100	5,810	4,020	5,540	9,310	6,200
23	4,500	3,940	5,810	21,700	36,300	27,600	12,800	5,630	4,100	5,630	9,310	6,000
24	4,450	3,940	6,200	22,500	36,600	26,400	12,500	5,450	3,880	5,670	9,310	5,810
25	4,400	3,940	6,630	23,500	36,300	26,100	12,200	5,450	4,060	5,670	9,310	5,630
26	4,400	3,820	7,860	26,400	37,600	25,200	11,700	5,110	3,820	5,720	9,310	5,450
27	4,400	3,880	8,130	30,300	38,900	24,700	11,200	5,030	3,820	5,810	9,470	5,280
28	4,400	3,940	8,410	31,300	38,900	24,100	10,700	4,790	3,860	5,810	9,000	5,490
29	4,400	.....	8,700	31,600	38,900	23,600	10,200	4,640	3,640	5,850	9,000	5,280
30	4,260	.....	9,000	34,700	38,900	23,000	9,600	4,870	3,760	5,850	9,000	5,360
31	4,120	.....	9,630	.....	38,900	.....	9,000	4,720	.....	5,900	.....	5,360

NOTE.—Daily discharges determined from a well-defined discharge rating curve. Discharge interpolated for days on which gage was not read, and also for Jan. 2 when gage height was reduced by wind effect.

Monthly discharge of Flathead River below Polson, Mont., for 1910.

[Drainage area, 7,010 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	7,100	4,120	5,080	0.725	0.84	312,000	B.
February	4,120	3,820	4,030	.575	.60	224,000	B.
March	9,630	3,820	5,290	.755	.87	325,000	A.
April	34,700	9,800	17,200	2.45	2.73	1,020,000	A.
May	42,800	33,800	38,000	5.42	6.25	2,340,000	A.
June	38,900	23,000	31,100	4.44	4.95	1,850,000	A.
July	22,000	9,000	15,200	2.17	2.50	935,000	C.
August	8,740	4,640	6,410	.914	1.05	394,000	A.
September	4,720	3,640	4,270	.609	.68	254,000	A.
October	5,900	3,720	5,010	.715	.82	308,000	A.
November	9,470	5,900	7,860	1.12	1.25	468,000	A.
December	9,000	5,280	7,180	1.02	1.18	441,000	A.
The year	42,800	3,640	12,300	1.75	23.72	8,870,000	

MIDDLE FORK OF FLATHEAD RIVER AT BELTON, MONT.

This station, which is located just opposite the Great Northern Railway depot at Belton, was established September 24, 1910.

The gage is a vertical staff fastened to a large bowlder on the left bank.

The channel is composed of small bowlders.

Discharge measurements are made from a cable near the gage.

The relation between gage height and discharge is not affected by ice during the winter months.

Discharge measurements of Middle Fork of Flathead River at Belton, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 24	McChristie and Heidel	159	306	(a)	615
Oct. 15	W. G. Lamb	173	509	3.54	1,380
Nov. 25	B. E. Jones	179	544	4.02	1,790

[a] Gage height not determined.

Daily gage height, in feet, and discharge, in second-feet, of Middle Fork of Flathead River at Belton, Mont., for 1910.

[L. E. Smith, observer.]

Day.	October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.70	1,490	3.35	1,200
2			3.60	1,400	3.30	1,170
3			3.52	1,340	3.30	1,170
4			3.50	1,320	3.22	1,110
5			3.38	1,230	3.15	1,060
6			3.30	1,170	3.10	1,030
7			3.22	1,110	3.02	974
8			3.68	1,470	2.98	948
9			4.22	2,010	3.00	960
10			4.15	1,940	2.92	912
11			5.22	3,270	2.62	732
12			5.50	3,700	2.62	732
13			5.50	3,700	2.70	780
14			5.40	3,540	2.68	768
15	3.54	1,350	4.90	2,830	2.60	720
16	3.48	1,300	4.65	2,510	2.52	680
17	3.40	1,240	4.40	2,210	2.72	792
18	3.40	1,240	4.20	1,990	2.68	768
19	3.38	1,230	4.08	1,860	2.55	695
20	3.25	1,140	3.95	1,730	2.40	620
21	3.15	1,060	3.95	1,730	2.28	560
22	3.08	1,020	4.45	2,270	2.50	670
23	3.00	960	4.30	2,100	2.50	670
24	3.00	960	4.18	1,970	2.60	720
25	3.18	1,090	4.00	1,780	2.55	695
26	5.22	3,270	3.88	1,660	2.50	670
27	4.95	2,900	3.75	1,540	2.50	670
28	4.50	2,330	3.60	1,400	2.48	660
29	4.25	2,040	3.55	1,360	2.42	630
30	4.05	1,830	3.45	1,280	2.45	645
31	3.90	1,680			2.42	630

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Monthly discharge of Middle Fork of Flathead River at Belton, Mont., for 1910.

[Drainage area, 900 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
October 15–31	3,270	960	1,570	1.74	1.10	5,290	B.
November	3,700	1,110	1,960	2.18	2.43	117,000	B.
December	1,200	560	808	.898	1.04	49,700	B.

SOUTH FORK OF FLATHEAD RIVER NEAR COLUMBIA FALLS, MONT.

This station, which is located on the right span of the highway bridge, one-half mile above the junction of the South Fork with Flathead River, in the NW. ¼ SW. ¼ sec. 4, T. 20 N., R. 19 W., was established September 20, 1910.

The drainage area at this point comprises 1,640 square miles.

A standard chain gage is attached to the right span of the bridge.

The bed of the stream is composed of gravel and small rock. The channel is broken by two piers and is comparatively regular in cross section. The current is uniform at all points.

Discharge measurements are made by wading or from the highway bridge.

The relation between gage height and discharge is affected by backwater from Flathead River and by logs lodging on the control point and on the banks of the streams. During the winter months it is affected by ice.

The gage was not read during 1910, as there was no observer.

Discharge measurements of South Fork of Flathead River near Columbia Falls, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 20	Richards and Heidel	223	376	3.12	597
Oct. 14	W. A. Lamb	249	602	4.05	1,460
Nov. 27	B. E. Jones	260	710	4.55	2,500

SWAN RIVER AT SWAN RIVER RANGER STATION, NEAR BIG FORK, MONT.

This station, which is located in sec. 27, T. 25 N., R. 18 W., one-half mile from the Bog cabin, 1½ miles from the ranger station, 2 miles above the entrance of the river into Swan Lake, and about 20 miles from Big Fork, Mont., was established October 10, 1910.

The drainage area above this point comprises 653 square miles.

The gage is a vertical staff attached to a tree in the bayou.

The bed of the stream is composed of gravel and small rock, and is probably permanent.

Discharge measurements are made by wading or from a cable or boat.

The relation between gage height and discharge at this point is affected by backwater from the lake during the season of high water and by ice during the winter.

The following discharge measurement was made by J. C. Beebe:

October 10, 1910: Width, 143 feet; area, 234 square feet; gage height, 1.11 feet; discharge, 557 second-feet.

Daily gage height, in feet, of Swan River near Big Fork, Mont., for 1910.

[B. Sutherland, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1		1.37	1.31	11		1.87	0.84	21		1.59	0.83
2				12	1.11			22	0.97		
3		1.29	1.26	13		2.26	1.08	23		1.75	.92
4				14	.98			24	.94		
5		1.19	1.29	15		1.87	.87	25		1.61	.95
6				16	1.02			26	1.30		
7		1.14	1.20	17		1.61	1.03	27		1.49	.93
8				18	1.03			28	1.41		
9		1.41	1.15	19		1.48	.87	29		1.41	.91
10	1.11			20	1.02			30	1.39		
								31			.91

LITTLE BITTERROOT RIVER NEAR MARION, MONT.

This station, which is at the log bridge crossing the stream just below the outlet of Little Bitterroot Lake near Marion, Mont., was established January 1, 1910.

The gage is a staff fastened to a post near the middle of the stream.

Discharge measurements are most conveniently made by wading.

The relation between gage height and discharge at this station is little, if any, affected by ice.

Discharge measurements of Little Bitterroot River near Marion, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 15	Raymond Richards	20	37	2.64	36
May 16	W. A. Lamb	10	6.8	1.24	6.1
June 27	do	14	15.1	1.80	15
Sept. 19	M. E. McChristie	16	13.7	1.56	12

Daily gage height, in feet, of Little Bitterroot River near Marion, Mont., for 1910.

[Byrl Kelsey, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			2.6	2.45		0.45	1.25		
2		2.4			1.45			0.85	0.95
3			2.6	2.4		.55	1.35		
4		2.3			1.35			.85	1.05
5			2.6	2.35		.65	1.35		
6		2.1			1.35			.75	1.05
7			2.6	2.3		.65	1.45		
8		1.9			1.15			.85	.95
9			2.5	2.15		1.0	1.5		
10		1.9			1.1			.9	1.0
11			2.4	2.05		1.85	1.45		
12		2.0			.95			.95	.95
13			2.3	2.1		1.75	1.35		
14		1.6			.95			1.05	.85
15	2.65		2.1	1.95		1.65	1.25		
16	2.65	1.1			.75			1.15	.85
17			2.1	2.0		1.65	1.25		
18	2.65	1.0			.75			1.1	.9
19			2.1	1.85		1.55	1.3		
20	2.3	1.0			.7			.95	.85
21			2.0	1.85		1.45	1.15		
22	2.4	1.0			.65			.95	.85
23			1.9	1.8		1.45	1.15		
24	2.4	2.9			.65			.95	.85
25			1.8	1.65		1.45	1.05		
26	2.4	2.8			.65			1.05	.75
27			1.8	1.7		1.4	1.1		
28	2.4	2.7			.65			1.0	.65
29			2.5	1.55		1.35	.85		
30	2.4	2.6			.5			.95	.7
31				1.6			.85		

Daily discharge, in second-feet, of Little Bitterroot River near Marion, Mont., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	18	30	35	31	11	1.1	6.3	2.6	3.2
2	19	30	35	30	9.4	1.2	7.0	2.6	3.2
3	20	29	35	30	8.6	1.3	7.8	2.6	3.6
4	21	28	35	30	7.8	1.4	7.8	2.6	4.0
5	22	25	35	29	7.8	1.6	7.8	2.3	4.0
6	23	22	35	28	7.8	1.6	8.6	2.0	4.0
7	24	20	35	28	6.4	1.6	9.4	2.3	3.6
8	25	18	34	26	5.0	2.6	9.8	2.6	3.2
9	26	18	32	24	4.7	3.5	10.2	2.7	3.4
10	27	18	31	22	4.4	10.2	9.8	2.8	3.5
11	28	19	30	21	3.8	17	9.4	3.0	3.4
12	30	20	29	22	3.2	16	8.6	3.2	3.2
13	32	16	28	22	3.2	15	7.8	3.6	2.9
14	34	12	25	20	3.2	14	7.0	4.0	2.6
15	36	8.2	22	19	2.6	13	6.3	4.5	2.6
16	36	4.4	22	20	2.0	13	6.3	5.0	2.6
17	36	4.0	22	20	2.0	13	6.3	4.7	2.7
18	36	3.5	22	18	2.0	12	6.6	4.4	2.8
19	32	3.5	22	17	1.9	11	7.0	3.8	2.7
20	28	3.5	21	17	1.8	10.2	6.0	3.2	2.6
21	29	3.5	20	17	1.7	9.4	5.0	3.2	2.6
22	30	3.5	19	16	1.6	9.4	5.0	3.2	2.6
23	30	23	18	16	1.6	9.4	5.0	3.2	2.6
24	30	43	17	14	1.6	9.4	4.5	3.2	2.6
25	30	42	16	13	1.6	9.4	4.0	3.6	2.3
26	30	40	16	14	1.6	9.0	4.2	4.0	2.0
27	30	39	16	14	1.6	8.5	4.4	3.8	1.8
28	30	38	24	12	1.6	8.2	3.5	3.5	1.6
29	30	36	32	11	1.4	7.8	2.6	3.4	1.7
30	30	35	32	12	1.2	7.0	2.6	3.2	1.8
31		35		12	1.2		2.6		1.8

NOTE.—Daily discharge determined from a rating curve fairly well defined above 4.4 second-feet. Discharge interpolated for days on which gage was not read.

Monthly discharge of Little Bitterroot River near Marion, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 4	246	D.
February	.....	.....	[a] 4	222	D.
March	.....	.....	[a] 28	1,720	D.
April	.....	.....	28.4	1,690	C.
May	43	35	22	1,350	B.
June	35	16	26	1,550	B.
July	31	11	20	1,230	B.
August	11	1.2	3.7	228	C.
September	17	1.1	8.3	494	B.
October	10.2	2.6	6.4	394	B.
November	5.0	2.0	3.3	196	C.
December	4.0	1.6	2.8	172	B.
The year	.....	.....	31.1	9,490	

[a] Estimated by comparison with estimates obtained on Little Bitterroot near Hubbart post office.

LITTLE BITTERROOT RIVER NEAR HUBBART, MONT.

This station, which is located 1½ miles west of the ranch building of the Hubbart Cattle Co. and just above the canyon leading to the second fall of the Little Bitterroot, was established April 22, 1909, in a box canyon just below the falls, 1½ miles from the Hubbart post office, and 15 miles south of Marion, and was moved to the present site, about 1 mile farther upstream, on October 17, 1909.

A few small streams enter the creek above the station, but the principal source of water supply is Bitterroot Lake.

The gage is a staff and its datum bears no determined relation to the datum of the gage used at the original site.

All discharge measurements are made by wading.

The stream freezes over at the gage in winter. Records of flow so far obtained are only fair.

Discharge measurements of Little Bitterroot River near Hubbart, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 14	Raymond Richards	35	93	3.44	155
May 17	W. A. Lamb	25	49	2.40	72
Sept. 20	M. E. McChristie	27	26	1.62	21

Daily gage height, in feet, of Little Bitterroot River near Hubbart, Mont., for 1910.

[Wm. K. Hubbart, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		2.45	3.00		1.94	1.56	1.44	1.60	
2				2.35					1.55
3		2.50	2.80		1.90	1.55	1.44	1.55	
4				2.33					1.55
5		2.52	2.72		1.98	1.55	1.44	1.55	
6				2.30					1.55
7		2.70	2.66		2.00	1.53	1.45	1.55	
8				2.26					1.55
9		3.00	2.66		1.79	1.50	1.45	1.55	
10				2.15					1.60
11		3.38	2.64		1.79	1.48	1.46	1.55	
12				2.08					1.60
13		3.65	2.68		1.77	1.47	1.48	1.55	
14	3.45	3.44		2.03					1.60
15		3.64	2.66		1.75	1.45	1.50	1.55	
16	3.55			1.96					1.60
17		3.60	2.35		1.73	1.45	1.50	1.55	
18	3.35			1.90					1.55
19		3.53	2.20		1.71	1.45	1.50	1.55	
20	3.70			1.90			1.60		1.55
21		3.33	2.13		1.70	1.45	1.50	1.55	
22	4.00			1.90					1.55
23		3.25	2.11		1.68	1.45	1.55	1.55	
24	3.72			1.86					1.55
25		3.45	2.45		1.66	1.44	1.55	1.55	
26	3.15			1.81					1.55
27		3.25	2.38		1.63	1.44	1.55	1.55	
28	3.05			1.86					1.55
29		3.02	2.38		1.60	1.44	1.55	1.55	
30	2.75			1.85					1.55
31			2.38			1.44		1.55	

Daily discharge, in second-feet, of Little Bitterroot River near Hubbart, Mont., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	20	76	119	70	40	17	10	19	16
2	30	78	111	68	38	16	10	18	16
3	50	80	103	68	37	16	10	16	16
4	75	80	100	67	40	16	10	16	16
5	100	81	96	66	43	16	10	16	16
6	110	88	94	65	44	16	10	16	16
7	120	94	91	64	44	15	10	16	16
8	130	106	91	62	37	14	10	16	16
9	140	119	91	58	30	13	10	16	18
10	150	135	90	54	30	12	10	16	19
11	150	151	90	52	30	12	11	16	19
12	150	164	92	50	30	12	12	16	19
13	154	176	93	48	29	11	12	16	19
14	158	157	92	46	28	10	12	16	19
15	162	175	91	44	28	10	13	16	19
16	166	173	80	41	28	10	13	16	19
17	157	171	68	39	27	10	13	16	18
18	148	168	63	37	26	10	13	16	16
19	164	165	58	37	26	10	13	16	16
20	180	156	56	37	26	10	19	16	16
21	193	147	53	37	25	10	13	16	16
22	206	144	52	37	24	10	14	16	16
23	194	140	52	36	24	10	16	16	16
24	182	149	64	35	24	10	16	16	16
25	157	158	76	34	23	10	16	16	16
26	132	149	74	32	22	10	16	16	16
27	128	140	71	33	21	10	16	16	16
28	124	130	71	35	20	10	16	16	16
29	111	121	71	34	19	10	16	16	16
30	98	120	71	34	18	10	18	16	16
31	87		71		18	10		16	

NOTE.—Daily discharge determined from a discharge rating curve fairly well defined between 8 and 31 second-feet.

Discharge interpolated for days on which gage height was not recorded.

Monthly discharge of Little Bitterroot River near Hubbart, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January			[a] 18	1,110	D.
February			[a] 18	1,000	D.
March			133	8,180	C.
April	176	76	133	7,910	B.
May	119	52	80	4,920	B.
June	70	32	47	2,800	B.
July	44	18	29	1,780	B.
August	17	10	12	740	B.
September	19	10	13	774	B.
October	19	16	16	984	B.
November	19	16	17	1,010	B.
December			[a] 16	984	D.
The year			44.3	32,200	

[a] Estimated.

CROW CREEK NEAR RONAN, MONT.

This station, which is located about 4 miles south of Ronan, Mont., at the highway bridge on the stage road from St. Ignatius to Ronan, was established September 21, 1906.

No important tributaries enter the creek above the station, and no water is diverted. Mud and Spring creeks join Crow Creek several miles below.

A staff gage is nailed to the bridge pier on the left bank. Its datum has not been changed since the station was established.

The current is sluggish and the channel does not change appreciably except during flood stages.

High-water measurements are made from the bridge; at low stages measurements may be more accurately made by wading.

The relation between gage height and discharge during the winter months is affected by ice.

Discharge measurements of Crow Creek near Ronan, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 12	Raymond Richards	37	68	2.78	106
May 26	W. A. Lamb	30	136	4.40	220
June 21	Raymond Richards	28	52	2.72	107
Aug. 3	W. A. Lamb	29	16.5	1.11	24.4
3	do	30	16.3	1.11	25.1
Sept. 27	G. L. Sperry	18	14.2	.80	16.3
Oct. 4	B. E. Jones	32	33	1.12	22

Daily gage height, in feet, of Crow Creek near Ronan, Mont., for 1910.

[Mrs. A. McIntyre, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.40	3.95	3.70	1.85	1.10	1.10	.....	1.20	1.20
2	1.22	1.40	3.65	3.50	1.80	1.10	1.15	1.05	1.25	1.20
3	1.30	1.40	3.35	3.20	1.80	1.15	1.15	1.05	1.25	1.18
4	1.30	1.40	3.25	3.10	1.80	1.10	1.10	1.12	1.25	1.15
5	1.32	1.40	3.35	3.00	1.80	.....	1.10	1.01	1.30	1.15
6	1.40	1.55	3.55	3.15	1.50	1.10	1.10	1.06	1.30	1.15
7	1.48	1.75	3.85	3.35	1.30	1.10	1.10	1.05	1.35	1.20
8	1.55	1.90	4.65	3.35	1.30	1.10	1.10	1.04	1.30	1.20
9	1.60	2.00	5.00	3.05	1.30	1.10	1.05	1.02	1.32	1.20
10	1.60	2.10	5.+	3.00	1.30	1.10	1.05	1.02	1.40	1.20
11	1.50	2.20	5.+	2.90	1.30	1.10	.....	1.02	1.50	1.15
12	1.50	2.65	5.+	2.95	1.30	1.10	.....	.....	1.60	1.20
13	1.40	3.05	5.00	3.45	1.30	1.10	.....	.....	1.60	1.30
14	1.40	2.85	4.85	3.60	1.35	.....	.....	.....	1.58	1.20
15	1.50	2.65	4.70	3.50	1.40	.....	.....	.....	1.48	1.15
16	1.50	2.50	4.60	3.55	1.40	1.10	.....	1.10	1.40	1.10
17	1.70	2.35	4.25	3.50	1.40	1.15	.....	1.20	1.40	1.10
18	1.62	2.50	3.90	3.50	1.35	1.10	.....	1.30	1.40	1.10
19	1.55	2.60	3.50	3.20	1.30	1.10	.....	1.30	1.40	1.10
20	1.65	2.60	3.05	3.20	1.20	1.10	.....	1.18	1.30	1.10
21	2.00	2.70	2.75	2.70	1.20	1.10	.....	1.05	1.30	1.10
22	2.50	2.90	3.00	2.80	1.20	1.10	.....	1.00	1.25	1.10
23	2.85	3.10	3.50	2.70	1.20	1.10	.....	1.00	1.25	1.08
24	2.78	3.30	3.60	2.70	1.20	1.10	.....	1.10	1.20	1.05
25	1.90	3.65	3.85	2.70	1.20	1.05	.....	1.25	1.20	1.05
26	1.80	4.05	4.40	2.70	1.20	1.10	.....	1.45	1.20	1.00
27	1.70	4.45	4.60	2.65	1.15	1.05	.80	1.30	1.20	1.00
28	1.60	4.50	4.30	2.55	1.15	1.05	.....	1.20	1.15	1.00
29	1.60	4.35	.....	2.40	1.10	1.05	.....	1.12	1.15	.90
30	1.50	4.25	3.45	2.25	1.10	1.05	.....	1.10	1.15	.90
31	1.50	.....	3.70	.....	1.10	.....	.....	1.10	.....	.90

Daily discharge, in second-feet, of Crow Creek near Ronan, Mont., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	28	35	188	170	56	23	23	20	27	27
2	28	35	166	156	53	23	25	22	29	27
3	31	35	146	135	53	25	25	22	29	26
4	31	35	138	128	53	23	23	24	29	25
5	32	35	146	122	53	23	23	20	31	25
6	35	41	160	132	39	23	23	22	31	25
7	38	50	180	146	31	23	23	22	33	27
8	41	58	238	146	31	23	23	21	31	27
9	43	63	265	125	31	23	22	21	32	27
10	43	68	300	122	31	23	22	21	35	27
11	39	73	300	115	31	23	22	21	39	25
12	39	100	300	118	31	23	22	21	43	27
13	35	125	265	152	31	23	22	22	43	31
14	35	112	253	163	33	23	22	22	42	27
15	39	100	242	156	35	23	22	23	38	25
16	39	91	235	160	35	23	20	23	35	23
17	48	82	210	156	35	25	20	27	35	23
18	44	91	184	156	33	23	20	31	35	23
19	41	97	156	135	31	23	18	31	35	23
20	46	97	125	135	27	23	18	26	31	23
21	63	103	106	103	27	23	18	22	31	23
22	91	115	122	109	27	23	18	20	29	23
23	112	128	156	103	27	23	16	20	29	22
24	108	142	163	103	27	23	16	23	27	22
25	58	166	180	103	27	22	16	29	27	22
26	53	196	220	103	27	23	16	37	27	26
27	48	224	235	100	25	22	14	31	27	20
28	43	228	213	94	25	22	14	27	25	20
29	43	216	183	85	23	22	16	24	25	17
30	39	210	153	76	23	22	18	23	25	17
31	39	.....	170	.....	23	22	.....	23	.....	17

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve. Discharge interpolated for days on which gage heights were not recorded.

Monthly discharge of Crow Creek near Ronan, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 25	1,540	D.
February	.....	.....	[a] 25	1,390	D.
March	112	28	46.8	2,880	B.
April	228	35	105	6,250	B.
May	300	106	197	12,100	B.
June	170	76	127	7,560	B.
July	56	23	33.4	2,050	B.
August	25	22	22.9	1,410	B.
September	25	14	20.0	1,190	C.
October	37	20	23.9	1,470	B.
November	43	25	31.8	1,890	B.
December	31	17	23.7	1,460	B.
The year	300	14	57.1	41,200	

[a] Estimated.

MUD CREEK NEAR RONAN, MONT.

Mud Creek rises about 6 miles southeast of Flathead Lake and flows southward into Crow Creek.

The gaging station, which is located on Jeffrey's ranch, 3 miles northwest of Ronan, Mont., was established April 17, 1908.

Pablo ditch, which takes water from the creek about 200 feet below the gage, is the only important diversion.

The gage is a staff nailed to a post driven in the stream just above a footbridge from which discharge measurements are made.

The current is sluggish and the accurate determination of discharge is difficult.

Discharge measurements of Mud Creek near Ronan, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 13	Raymond Richards	6	18	2.86	7.6
May 27	W. A. Lamb	9	23	3.58	16
June 21	Raymond Richards	6	18.8	3.11	17.6
Oct. 5	.....do	7	16	2.45	3.9

Daily gage height, in feet, of Mud Creek near Ronan, Mont., for 1910.

[F. O. Jeffrey, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.05	2.85	3.45	3.31	2.70	2.54	2.50	2.40	2.38	2.38
2	3.05	2.90	3.45	3.32	2.50	2.54	2.50	2.40	2.45	2.40
3	3.05	2.93	3.75	3.38	2.40	2.54	2.50	2.40	2.48	2.45
4	3.10	2 93	3.75	3.38	2.40	2.58	2.50	2.40	2.48	2.45
5	3.10	2.93	3.75	3.40	2.40	2.58	2.45	2.40	2.50	2.40
6	3.05	2.90	3.05	3.40	2.40	2.58	2.45	2.40	2.50	2.40
7	3.05	2.90	3.05	3.35	2.50	2.50	2.45	2.40	2.48	2.40
8	3.05	2.85	3.05	3.30	2.50	2.50	2.45	2.40	2.48	2.40
9	3.05	2.85	3.05	3.40	2.50	2.50	2.45	2.40	2.50	2.40
10	3.75	2.85	3.15	3.38	2.70	2.50	2.45	2.40	2.50	2.40
11	3.75	2.85	3.23	3.38	2.70	2.48	2.42	2.40	2.48	2.40
12	3.75	2.90	3.23	3.40	2.80	2.48	2.42	2.40	2.48	2.40
13	3.75	2.90	3.25	3.38	2.90	2.50	2.42	2.40	2.50	2.40
14	3.75	2.90	3.33	3.35	2.90	2.50	2.42	2.40	2.50	2.40
15	3.45	2.90	3.45	3.30	2.70	2.50	2.40	2.40	2.50	2.40
16	3.45	2.90	3.45	3.28	2.70	2.50	2.40	2.40	2.50	2.40
17	3.45	2.90	3.45	3.28	2.74	2.50	2.40	2.40	2.50	2.40
18	3.45	2.90	3.43	3.28	2.70	2.50	2.40	2.40	2.48	2.40
19	2.95	2.93	3.43	3.28	2.70	2.50	2.40	2.38	2.48	2.40
20	2.95	2.93	3.43	3.28	2.70	2.50	2.40	2.38	2.45	2.40
21	2.95	2.93	3.45	3.25	2.70	2.55	2.40	2.38	2.45	2.40
22	2.95	2.95	3.40	3.25	2.70	2.50	2.40	2.38	2.40	2.38
23	2.95	2.95	3.35	3.25	2.70	2.50	2.40	2.38	2.40	2.38
24	2.90	3.05	3.33	3.28	2.60	2.48	2.40	2.38	2.40	2.38
25	2.93	3.45	3.23	3.28	2.70	2.48	2.40	2.38	2.38	2.38
26	2.93	2.93	3.23	3.28	2.70	2.48	2.40	2.38	2.38	2.38
27	2.90	2.93	3.05	3.28	2.70	2.48	2.40	2.38	2.38	2.38
28	2.90	2.93	3.55	3.28	2.70	2.50	2.40	2.38	2.36	2.38
29	2.85	2.95	3.35	3.28	2.70	2.50	2.40	2.38	2.36	2.38
30	2.85	2.95	3.05	3.28	2.60	2.50	2.40	2.38	2.38	2.38
31	2.85	.....	3.15	.....	2.55	2.50	.....	2.38	.....	2.38

Daily discharge, in second-feet, of Mud Creek near Ronan, Mont., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.8	6.8	14	12	5.5	4.4	4.1	3.5	3.4	3.4
2	8.8	7.2	14	12	4.1	4.4	4.1	3.5	3.8	3.5
3	8.8	7.5	20	13	3.5	4.4	4.1	3.5	4.0	3.8
4	9.4	7.5	20	13	3.5	4.6	4.1	3.5	4.0	3.8
5	9.4	7.5	20	14	3.5	4.6	3.8	3.5	4.1	3.5
6	8.8	7.2	8.8	14	3.5	4.6	3.8	3.5	4.1	3.5
7	8.8	7.2	8.8	13	4.1	4.1	3.8	3.5	4.0	3.5
8	8.8	6.8	8.8	12	4.1	4.1	3.8	3.5	4.0	3.5
9	8.8	6.8	8.8	14	4.1	4.1	3.8	3.5	4.1	3.5
10	20	6.8	10	13	5.5	4.1	3.8	3.5	4.1	3.5
11	20	6.8	11	13	5.5	4.0	3.6	3.5	4.0	3.5
12	20	7.2	11	14	6.3	4.0	3.6	3.5	4.0	3.5
13	20	7.2	11	13	7.2	4.1	3.6	3.5	4.1	3.5
14	20	7.2	12	13	7.2	4.1	3.6	3.5	4.1	3.5
15	14	7.2	14	12	5.5	4.1	3.5	3.5	4.1	3.5
16	14	7.2	14	12	5.5	4.1	3.5	3.5	4.1	3.5
17	14	7.2	14	12	5.8	4.1	3.5	3.5	4.1	3.5
18	14	7.2	14	12	5.5	4.1	3.5	3.5	4.0	3.5
19	7.8	7.5	14	12	5.5	4.1	3.5	3.4	4.0	3.5
20	7.8	7.5	14	12	5.5	4.1	3.5	3.4	3.8	3.5
21	7.8	7.5	14	11	5.5	4.4	3.5	3.4	3.8	3.5
22	7.8	7.8	14	11	5.5	4.1	3.5	3.4	3.5	3.4
23	7.8	7.8	13	11	5.5	4.1	3.5	3.4	3.5	3.4
24	7.2	8.8	12	12	4.7	4.0	3.5	3.4	3.5	3.4
25	7.5	14	11	12	5.5	4.0	3.5	3.4	3.4	3.4
26	7.5	7.5	11	12	5.5	4.0	3.5	3.4	3.4	3.4
27	7.2	7.5	8.8	12	5.5	4.0	3.5	3.4	3.4	3.4
28	7.2	7.5	16	12	5.5	4.1	3.5	3.4	3.4	3.4
29	6.8	7.5	13	12	5.5	4.1	3.5	3.4	3.4	3.4
30	6.8	7.5	8.8	12	4.7	4.1	3.5	3.4	3.4	3.4
31	6.8	.....	10	.....	4.4	4.1	.....	3.4	.....	3.4

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve.

Monthly discharge of Mud Creek near Ronan, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January			[a] 4	246	D.
February			[a] 5	278	D.
March	20	6.8	10.7	658	C.
April	14	6.8	7.56	450	C.
May	20	8.8	12.7	781	C.
June	14	11	12.4	738	C.
July	7.2	3.5	5.12	315	C.
August	4.6	4.0	4.17	256	C.
September	4.1	3.5	3.65	217	C.
October	3.5	3.4	3.46	213	C.
November	4.1	3.4	3.82	227	C.
December	3.8	3.4	3.48	214	C.
The year			6.34	4,590	

[a] Estimated.

MISSION CREEK NEAR ST. IGNATIUS, MONT.

This station, which is located opposite the home of A. A. Booke, about 1 mile downstream from St. Ignatius, was established September 21, 1906.

Two or three small ditches divert water above the gage to irrigate about 800 acres near St. Ignatius Mission.

A few miles above the station, where the stream flows out from mountains, it falls nearly 1,000 feet and affords an excellent opportunity for water-power development.

The staff gage was washed out July 5, 1907, and on July 24 a new gage was installed a short distance downstream and with a datum 0.30 foot lower. On January 25, 1908, this gage was lowered 0.39 foot. The gage was again destroyed by high water June 7, 1908, and was replaced, June 26, 20 feet farther downstream at a different datum.

Discharge measurements are made by wading near the gage.

The current is swift and the relation of gage height to discharge is but little affected by ice during the winter months. The channel shifts during high water, but at ordinary stages the conditions for obtaining accurate discharge data are good.

Discharge measurements of Mission Creek near St. Ignatius, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 18	Raymond Richards	22	14	2.20	26
May 25	W. A. Lamb	34	40	3.25	156
June 20	Raymond Richards	30	35	2.99	116
Aug. 3	W. A. Lamb	20	19	2.43	40
Sept. 24	G. L. Sperry	11	11	2.28	25
Oct. 4	Raymond Richards	23	16	2.30	29

Daily gage height, in feet, of Mission Creek near St. Ignatius, Mont., for 1910.

[Annie A. Booke, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.05	2.5	2.15	.....	.....	2.85	2.35	2.15	.....	2.3	.....
2	.....	2.0	2.6	2.1	2.6	.....	2.7	.....	2.15	.....	.....	.....
3	2.05	.....	2.3	.....	2.55	.....	.....	2.4	.....	.....	2.3	.....
4	2.05	2.0	2.2	2.15	2.55	.....	2.65	2.4	2.2	.....	.....	.....
5	2.1	1.95	2.15	.....	2.65	.....	2.6	2.35	2.2	.....	.....	2.2
6	2.0	2.0	.....	.....	2.85	.....	2.65	2.4	2.2	.....	2.3	2.2
7	2.05	1.95	2.15	2.1	3.0	3.0	2.6	.....	.....	.....	.....	.....
8	2.0	1.95	2.0	2.05	3.15	3.0	2.6	2.35	2.15	.....	2.3	.....
9	.....	2.0	.....	2.1	3.1	3.0	2.55	2.35	.....	.....	.....	2.15
10	2.05	2.05	2.0	.....	3.45	3.1	2.45	2.3	2.15	.....	.....	2.15
11	2.05	2.0	2.1	2.1	3.3	3.05	2.55	2.35	2.2	.....	2.4	.....
12	2.05	1.95	2.05	2.2	3.15	3.1	.....	.....	.....	2.3	2.4	.....
13	2.0	.....	.....	2.15	2.9	2.95	2.5	.....	2.2	.....	.....	2.15
14	.....	2.0	2.05	2.3	2.9	3.0	2.5	2.35	2.2	.....	.....	2.15
15	2.1	2.05	2.1	2.3	2.9	3.0	2.45	.....	2.2	2.3	2.3	2.15
16	2.0	2.05	2.0	2.25	2.8	3.1	2.55	2.3	2.2	.....	.....	.....
17	2.0	2.0	2.05	.....	2.7	3.1	.....	2.3	2.2	.....	2.3	2.1
18	2.0	2.05	2.0	.....	2.6	.....	2.45	2.25	2.2	2.3	2.3	.....
19	1.95	1.95	2.05	2.2	.....	3.5	2.5	2.3	.....	.....	2.3	2.1
20	2.0	.....	2.2	2.3	2.6	3.3	2.45	2.25	2.2	2.3	.....	2.1
21	2.0	.....	2.1	2.4	2.6	3.25	2.5	2.25	2.2	2.3	2.3	2.1
22	2.05	2.45	.....	2.4	.....	3.1	2.45	.....	2.2	2.3	2.3	2.1
23	.....	.....	2.35	.....	2.8	3.1	2.5	2.2	2.2	2.3	2.3	.....
24	2.05	.....	.....	2.6	3.1	3.1	2.45	2.2	2.3	2.3	2.3	.....
25	2.1	2.5	2.35	2.85	3.3	.....	2.5	2.25	2.2	.....	2.3	.....
26	2.05	.....	2.2	3.0	3.1	.....	.....	2.2	2.15	.....	.....	.....
27	2.0	2.55	.....	2.95	3.1	2.8	.....	2.25	.....	.....	.....	2.1
28	2.05	2.50	2.2	2.8	2.9	2.7	2.4	.....	2.25	2.35	.....	2.1
29	2.0	.....	2.15	2.75	.....	2.8	2.4	2.15	2.25	.....	.....	2.1
30	2.1	.....	2.15	.....	.....	3.0	2.35	.....	.....	2.3	.....	.....
31	2.1	.....	2.1	.....	.....	.....	.....	2.15	.....	2.3	.....	2.1

Daily discharge, in second-feet, of Mission Creek near St. Ignatius, Mont., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	15	15	46	20	64	100	89	32	20	26	28	24
2	15	13	57	17	57	102	69	34	20	26	28	24
3	15	13	28	18	52	104	66	36	21	26	28	23
4	15	13	22	20	52	106	63	36	22	26	28	23
5	17	12	20	19	63	108	57	32	22	26	28	22
6	13	13	20	18	89	100	63	36	22	27	28	22
7	15	12	20	17	112	112	57	34	21	27	28	21
8	13	12	13	17	140	112	57	32	20	27	28	21
9	14	13	13	17	130	112	52	32	20	27	30	20
10	15	15	13	17	200	130	41	28	20	27	33	20
11	15	13	17	17	170	121	52	32	22	27	36	20
12	15	12	15	18	140	130	49	32	22	28	36	20
13	13	12	15	20	96	104	46	32	22	28	33	20
14	15	13	15	28	96	112	46	32	22	28	30	20
15	17	15	17	28	96	112	41	30	22	28	28	20
16	13	15	13	25	82	130	52	28	22	28	28	18
17	13	13	15	24	69	130	46	28	22	28	28	17
18	13	15	13	23	57	170	41	25	22	28	28	17
19	12	12	15	22	57	210	46	28	22	28	28	17
20	13	22	22	28	57	170	41	25	22	28	28	17
21	13	32	17	36	57	160	46	25	22	28	28	17
22	15	41	25	36	70	130	41	24	22	28	28	17
23	15	42	32	46	82	130	46	22	22	28	28	17
24	15	44	32	57	130	130	41	22	28	28	28	17
25	17	46	32	88	170	114	46	25	22	29	28	17
26	15	49	22	112	130	98	43	22	20	30	27	17
27	13	52	22	104	130	82	40	25	22	31	26	17
28	15	46	22	82	96	69	36	22	25	32	26	17
29	13	.....	20	76	97	82	36	19	25	30	25	17
30	17	.....	20	70	98	112	32	19	26	28	25	17
31	17	.....	17	.....	99	.....	32	19	.....	28	.....	17

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve. Discharge interpolated for days on which gage heights were not recorded.

Monthly discharge of Mission Creek near St. Ignatius, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	17	12	14.5	892	B.
February	52	12	22.3	1,240	B.
March	57	13	21.6	1,330	B.
April	112	17	37.3	2,220	B.
May	200	52	98.0	6,030	B.
June	210	69	120	7,140	B.
July	89	32	48.8	3,000	B.
August	36	19	28.0	1,720	B.
September	28	20	22.1	1,320	B.
October	32	26	27.9	1,720	B.
November	36	25	28.6	1,700	B.
December	24	17	19.1	1,170	B.
The year			40.7	29,500	

DRY CREEK NEAR ST. IGNATIUS, MONT.

Dry Creek rises on the western slopes of the Mission Range in the southeastern part of the Flathead Indian Reservation and flows northwestward into Mission Creek. It is the outlet of St. Marys Lake, which will be used as a reservoir to store the entire flow of the stream.

The gaging station, which is located opposite Felsman's ranch, about 3½ miles southeast of St. Ignatius, was established April 16, 1908.

One small irrigation ditch diverts water above the station; the only tributary is a small creek which enters from the right a short distance below the station.

The gage is a staff nailed to a tree on the left bank; its datum has not been changed.

The bed of the stream is composed of coarse gravel and bowlders, and the current is swift.

Discharge measurements are made by wading near the gage. At low and medium stages none of the water reaches Mission Creek, and during the winter and early spring water ceases to flow at the gage.

Conditions for correct determination of discharge are fair.

Discharge measurements of Dry Creek near St. Ignatius, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 18	Raymond Richards				0.0
May 25	W. A. Lamb	16	13	1.02	41
June 20	Raymond Richards	15	13.5	.85	28.2
Oct. 4	do				.0

Daily gage height, in feet, of Dry Creek near St. Ignatius, Mont., for 1910.

[Henry Felsman, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Day.	Apr.	May.	June.	July.	Aug.
1	.....	0.6	0.7	0.7	0.1	16	.....	0.85	1.0	0.45	.....
2	.....	.8	.9	.8	.....	17	.....	.9	1.0	.5	.....
3	.....	.5	.7	.65	.....	18	.....	.8	1.1	.4	.....
4	.....	.4	.8	.75	.....	19	.....	.75	.95	.45	.....
5	.....	.6	.7	.7	.....	20	0.2	.8	.9	.45	.....
6	.....	.6	.8	.6	.....	21	.3	.7	.9	.35	.....
7	.....	.7	.7	.65	.....	22	.4	.8	.9	.4	.....
8	.....	.8	.9	.55	.....	23	.0	.7	.9	.3	.....
9	.....	1.0	.8	.6	.....	24	.2	1.0	.8	.4	.....
10	.....	1.1	.8	.6	.....	25	.4	1.0	.7	.35	.....
11	.....	1.1	.7	.5	.....	26	.55	1.1	.8	.25	.....
12	.....	1.1	.85	.55	.....	27	.65	1.05	.7	.3	.....
13	.....	.9	.8	.45	.....	28	.7	.9	.8	.2	.....
14	.....	.85	.9	.55	.....	29	.7	.9	.7	.2	.....
15	.....	1.0	.9	.55	.....	30	.75	.9	.7	.2	.....
						31	.....	.7	.....	.1	.....

Daily discharge, in second-feet, of Dry Creek near St. Ignatius, Mont., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Day.	Apr.	May.	June.	July.	Aug.
1	.....	14	19	19	1.0	16	.....	28	39	8.5	.....
2	.....	25	32	25	.....	17	.....	32	39	10	.....
3	.....	10	19	16	.....	18	.....	25	48	7	.....
4	.....	7	25	22	.....	19	.....	22	36	8.5	.....
5	.....	14	19	19	.....	20	2.4	25	32	8.5	.....
6	.....	14	25	14	.....	21	4.2	19	32	5.6	.....
7	.....	19	19	16	.....	22	7.0	25	32	7.0	.....
8	.....	25	32	12	.....	23	0	19	32	4.2	.....
9	.....	39	25	14	.....	24	2.4	39	25	7.0	.....
10	.....	48	48	14	.....	25	7.0	39	19	5.6	.....
11	.....	48	48	10	.....	26	12.0	48	25	3.3	.....
12	.....	48	28	12	.....	27	16.0	44	19	4.2	.....
13	.....	32	25	8.5	.....	28	19.0	32	25	2.4	.....
14	.....	28	32	12	.....	29	19.0	32	19	2.4	.....
15	.....	39	32	12	.....	30	22.0	32	19	2.4	.....
						31	.....	19	.....	1.0	.....

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve.

Monthly discharge of Dry Creek near St. Ignatius, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	22	0.0	3.70	220	B.
May	48	7	28.7	1,760	B.
June	48	19	27.2	1,620	B.
July	25	1.0	10.1	621	B.
The period				4,220	

NOTE.—Stream dry Jan. 1 to Apr. 19, and Aug. 1 to Dec. 31.

POST CREEK NEAR RONAN,[1] MONT.

Post Creek rises on the western slope of the Mission Range and flows southwestward to Mission Creek. It is the outlet of Lake McDonald and its flow can be equalized throughout the year by utilizing the lake for storage.

[1] Station described in report for 1909 as near St. Ignatius, Mont., as the observer obtained his mail at that post office.

The gaging station, which is located near the house of J. G. Fitzpatrick (formerly occupied by Joseph Allard), about 5 miles southeast of Ronan, Mont., and 10 miles north of St. Ignatius, was established September 21, 1906.

Two small ditches divert water above the gage to irrigate a few acres. The North Fork, the only important tributary, enters 2 or 3 miles below the gage.

During the flood of June, 1908, a new channel was opened through the timber on the right bank. Flow in this channel was first measured November 9, 1908.

The staff gage datum has remained unchanged.

Discharge measurements are made by wading just below the gage.

The current is swift, and the relation of gage height to discharge is but little affected by ice during the winter months.

Discharge measurements of Post Creek near Ronan, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 26	W. A. Lamb	64	93.5	2.13	213
June 21	Raymond Richards	54	71.2	2.01	195
Aug. 3	W. A. Lamb	42	39	1.39	53
Sept. 28	G. L. Sperry	14	15	1.20	29.9
Oct. 4	Raymond Richards	38	27	1.24	36

Daily gage height, in feet, of Post Creek near Ronan, Mont., for 1910.

[R. G. Fitzpatrick, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.09	1.20	1.10	1.10	1.65	2.50	1.85	1.40	1.25	1.20	1.30	1.20
2	1.10	1.05	1.20	1.15	1.60	2.55	1.85	1.45	1.25	1.15	1.25	1.20
3	1.10	1.15	1.25	1.15	1.70	2.05	1.85	1.40	1.25	1.20	1.30	1.25
4	1.10	1.15	1.20	1.10	1.70	1.90	1.72	1.35	1.20	1.15	1.25	1.20
5	1.10	1.20	1.25	1.15	1.70	1.90	1.75	1.40	1.25	1.25	1.30	1.25
6	1.10	1.15	1.25	1.15	1.90	1.85	1.70	1.40	1.25	1.20	1.25	1.20
7	1.20	1.10	1.15	1.10	1.92	1.78	1.60	1.35	1.15	1.20	1.25	1.20
8	1.15	1.15	1.20	1.15	2.10	1.90	1.70	1.40	1.20	1.25	1.40	1.25
9	1.15	1.10	1.15	1.15	2.10	1.85	1.65	1.35	1.15	1.20	1.40	1.20
10	1.10	1.15	1.20	1.20	2.25	1.95	1.70	1.40	1.15	1.25	1.50	1.25
11	1.15	1.10	1.15	1.25	2.20	1.88	1.60	1.35	1.10	1.20	1.50	1.20
12	1.10	1.15	1.20	1.30	2.25	2.02	1.65	1.45	1.15	1.20	1.60	1.15
13	1.15	1.15	1.20	1.45	2.15	1.95	1.65	1.45	1.15	1.25	1.65	1.20
14	1.10	1.15	1.15	1.35	1.95	1.85	1.60	1.40	1.15	1.20	1.60	1.15
15	1.15	1.15	1.20	1.40	1.90	1.88	1.65	1.45	1.15	1.25	1.60	1.15
16	1.10	1.20	1.25	1.40	1.85	2.05	1.70	1.45	1.20	1.20	1.50	1.10
17	1.10	1.15	1.20	1.30	1.75	2.00	1.60	1.40	1.15	1.20	1.50	1.10
18	1.15	1.20	1.25	1.35	1.75	2.12	1.65	1.40	1.20	1.25	1.45	1.15
19	1.10	1.15	1.20	1.30	1.70	2.05	1.60	1.40	1.15	1.20	1.30	1.10
20	1.10	1.20	1.25	1.45	1.75	2.05	1.65	1.50	1.25	1.25	1.35	1.15
21	1.10	1.15	1.25	1.48	1.75	2.00	1.60	1.40	1.20	1.20	1.25	1.10
22	1.10	1.15	1.25	1.50	1.85	2.00	1.65	1.40	1.30	1.20	1.25	1.10
23	1.20	1.15	1.35	1.50	1.95	1.88	1.60	1.50	1.30	1.25	1.25	1.15
24	1.10	1.20	1.30	1.48	2.00	1.80	1.55	1.35	1.25	1.20	1.20	1.10
25	1.15	1.20	1.35	1.55	2.05	1.80	1.60	1.35	1.30	1.25	1.25	1.15
26	1.15	1.20	1.38	1.72	2.15	1.75	1.55	1.40	1.30	1.30	1.20	1.10
27	1.10	1.10	1.22	1.80	2.10	1.80	1.50	1.30	1.20	1.30	1.20	1.10
28	1.15	1.10	1.20	1.80	2.05	1.90	1.55	1.30	1.25	1.35	1.25	1.15
29	1.10	.....	1.15	1.80	2.00	1.90	1.45	1.30	1.15	1.30	1.20	1.10
30	1.15	.....	1.20	1.80	2.05	1.95	1.45	1.40	1.15	1.35	1.25	1.15
31	1.10	.....	1.15	.....	2.00	.....	1.40	1.30	.....	1.30	.....	1.10

Daily discharge, in second-feet, of Post Creek near Ronan, Mont., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	26	35	27	27	96	347	140	56	40	35	45	35
2	27	24	35	31	86	356	140	62	40	31	40	35
3	27	31	40	31	105	195	140	56	40	35	45	40
4	27	31	35	27	105	152	109	50	35	31	40	35
5	27	35	40	31	105	152	116	56	40	40	45	40
6	27	31	40	31	152	140	105	56	40	35	40	35
7	35	27	31	27	158	123	86	50	31	35	40	35
8	31	31	35	31	210	152	105	56	35	40	56	40
9	31	27	31	31	210	140	96	50	31	35	56	35
10	27	31	35	35	260	166	105	56	31	40	69	40
11	31	27	31	40	243	147	86	50	27	35	69	35
12	27	31	35	45	260	187	96	62	31	35	86	31
13	31	31	35	62	226	166	96	62	31	40	96	35
14	27	31	31	50	166	140	86	56	31	35	86	31
15	31	31	35	56	152	147	96	62	31	40	86	31
16	27	35	40	56	140	195	105	62	35	35	69	27
17	27	31	35	45	116	181	86	56	31	35	69	27
18	31	35	40	50	116	217	96	56	35	40	62	31
19	27	31	35	45	105	195	86	56	31	35	45	27
20	27	35	40	62	116	195	96	69	40	40	50	31
21	27	31	40	66	116	181	86	56	35	35	40	27
22	27	31	40	69	140	181	96	56	45	35	40	27
23	35	31	50	69	166	147	86	69	45	40	40	31
24	27	35	45	66	181	127	78	50	40	35	35	27
25	31	35	50	78	195	127	86	50	45	40	40	31
26	31	35	54	109	226	116	78	56	45	45	35	27
27	27	27	37	127	210	127	69	45	35	45	35	27
28	31	27	35	127	196	152	78	45	40	50	40	31
29	27	.....	31	127	181	152	62	45	31	45	35	27
30	31	.....	35	127	196	166	62	56	31	50	40	31
31	27	.....	31	.....	181	.....	56	45	.....	45	.....	27

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve.

Monthly discharge of Post Creek near Ronan, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	35	26	28.8	1,770	B.
February	35	24	31.2	1,730	B.
March	54	27	37.2	2,290	B.
April	127	27	59.3	3,530	B.
May	260	86	165	10,100	C.
June	356	116	172	10,200	C.
July	140	56	93.8	5,770	B.
August	62	45	55.2	3,390	B.
September	45	27	35.9	2,140	B.
October	50	31	38.5	2,370	B.
November	96	35	52.5	3,120	B.
December	40	27	31.9	1,960	B.
The year	356	24	66.9	48,400	

JOCKO RIVER NEAR JOCKO, MONT.

This station, which is located at the highway bridge on the road between Jocko and Ravalli, about 1½ miles northwest of the Jocko Agency, was established August 20, 1908.

Big Knife and Blodgett creeks enter Jocko River above the gage, and Finley, Agency, and Valley creeks enter below the station. The

large canal recently constructed by the Reclamation Service diverts its water above the station. A few small ditches divert water from Jocko River between its source and Ravalli, and the waters of its tributaries are used to some extent for irrigation near the Jocko Agency. Indian ditch, diverted from the East Finley, is the largest ditch now in operation. Five thousand acres are to be irrigated in the upper Jocko Valley.

The gage is a staff nailed to the middle pier of the downstream side of the highway bridge. The gage datum has remained constant.

Measurements are made by wading at low water and from the highway bridge in flood season. The channel is not likely to shift in ordinary stages.

Discharge measurements of Jocko River near Jocko, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 19	Raymond Richards	43	80	8.15	358
May 30	W. A. Lamb	40	99	8.44	466
June 23	Raymond Richards	46	66	7.56	158
Aug. 5	W. A. Lamb	31	21.9	6.21	20.8
Oct. 7	Raymond Richards	48	45	6.88	67

Daily gage height, in feet, of Jocko River near Jocko, Mont., for 1910.

[Tony Delaware, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				8.42		6.17		6.82	
2		7.22			7.13				7.12
3						6.23		6.82	
4			8.32	8.68					
5							6.76	6.88	7.13
6					7.01	6.24			
7			8.64				6.72		7.09
8				8.63		6.23		6.86	
9		7.33			6.93				7.15
10						6.20	6.78	6.78	
11			8.92	8.07	6.88				
12							6.76	6.75	7.41
13			8.72		6.82				
14			8.80				6.75		7.30
15				7.87		6.22		6.73	
16		7.77			6.68				7.21
17						6.51	6.76	6.73	
18			8.42	7.73	6.64				
19	7.15						6.78	6.82	7.14
20		8.40			6.61	6.56			
21			8.32				6.98		7.16
22				7.50		6.58		6.74	
23		8.65			6.52				7.15
24						6.62	6.83	6.74	
25			8.62	7.38	6.45				
26	7.45						6.85	7.37	7.18
27		8.77			6.41	6.64			
28			8.49				6.80		7.06
29				7.19		6.55		7.00	
30		8.43			6.34				7.04
31						6.78		7.00	

Daily discharge, in second-feet, of Jocko River near Jocko, Mont., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	85	117	443	451	100	21	57	61	88
2	90	111	429	511	97	22	57	61	96
3	90	114	416	571	93	23	56	61	96
4	90	117	403	630	89	23	56	64	97
5	90	120	468	620	85	24	55	67	97
6	95	123	532	609	81	24	53	67	94
7	95	126	597	599	78	24	51	66	92
8	95	129	667	589	75	23	53	65	96
9	100	131	737	496	72	23	55	61	100
10	100	145	807	404	70	22	57	57	115
11	100	159	880	312	67	22	56	55	130
12	100	173	770	297	64	22	55	54	146
13	100	187	665	282	61	23	54	53	136
14	100	201	742	268	56	23	54	52	125
15	100	215	670	254	52	23	54	52	118
16	100	228	597	242	47	30	55	52	110
17	100	281	524	230	46	36	55	52	106
18	100	334	451	218	44	37	56	56	102
19	100	387	435	204	43	38	57	61	99
20	107	440	419	190	42	39	68	59	100
21	114	495	403	177	40	39	78	56	102
22	122	550	447	164	38	40	73	53	101
23	130	606	491	156	36	42	68	53	100
24	138	633	536	148	34	43	62	53	102
25	146	660	581	140	32	43	63	96	104
26	154	687	551	132	31	44	64	138	105
27	147	713	521	122	30	44	62	119	96
28	141	627	491	114	30	41	59	100	88
29	135	542	481	105	29	38	60	80	86
30	129	457	471	103	28	48	60	80	85
31	123	.....	461	.....	24	57	.....	80	.....

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve. Discharges interpolated for days on which gage heights were not recorded.

Monthly discharge of Jocko River near Jocko, Mont., for 1910.

Month.	Mean discharge in second-feet.	Run-off (total in acre-feet).	Accuracy.
January	[a] 85	5,230	D.
February	[a] 85	4,720	D.
March	110	6,760	C.
April	327	19,500	B.
May	551	33,900	B.
June	311	18,500	B.
July	55.3	3,400	B.
August	32.3	1,990	B.
September	58.8	3,500	B.
October	67.2	4,130	B.
November	104	6,190	B.
December	[a] 75	4,610	D.
The year	155	112,000	

[a] Estimated by comparison with records of flow obtained at the Ravalli gaging station.

JOCKO RIVER AT RAVALLI, MONT.

This station, which is located about 400 feet downstream from a point opposite the railroad station at Ravalli, Mont., was established October 18, 1906.

One large and several small ditches divert water above the station. The gage used during 1910 was a staff fastened to a log on the right

bank. A chain gage was installed in November, 1910, but was not used until 1911. The datum of the staff gage remained unchanged during its use.

The current is swift and the relation of gage height to discharge is little affected by ice during the winter months. The channel shifts during very high water but is practically permanent at ordinary stages.

At low and ordinary stages, discharge measurements are made by wading near the gage; flood-stage measurements can be made from a highway bridge three-fourths mile above the gage.

Conditions favor the accurate determination of discharge.

Discharge measurements of Jocko River at Ravalli, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 19	Raymond Richards	42	141	2.91	539
May 25	W. A. Lamb	52	136	3.61	824
June 22	Raymond Richards	52	90	2.25	263
Aug. 4	W. A. Lamb	42	54	1.68	120
Oct. 3	B. E. Jones	44	56	1.82	150

Daily gage height, in feet, of Jocko River at Ravalli, Mont., for 1910.

[G. D. Pendray, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	3.7	3.2	1.9	1.6	1.9	1.85	1.95	1.85
2	2.2	3.7	3.3	1.9	1.6	1.9	1.85	1.95	1.85
3	2.1	3.7	3.1	1.9	1.6	1.8	1.85	1.95	1.85
4	2.1	4.0	3.1	1.9	1.6	1.9	1.85	1.95	1.85
5	2.3	4.1	3.0	1.9	1.6	1.9	1.85	1.95	1.85
6	2.3	4.0	2.8	1.9	1.6	1.9	1.85	1.95	1.85
7	2.5	4.2	2.9	1.9	1.6	1.9	1.85	1.95	1.85
8	2.4	4.2	2.9	1.8	1.6	1.9	1.85	1.95	1.85
9	2.4	4.3	2.8	1.8	1.6	1.9	1.85	1.95	1.85
10	2.6	4.5	2.8	1.8	1.6	1.9	1.85	1.95	1.85
11	2.5	4.9	2.7	1.8	1.6	1.9	1.95	1.95	1.75
12	2.6	4.4	2.8	1.8	1.6	1.9	1.95	2.05	1.75
13	2.5	4.0	2.6	1.7	1.6	1.9	1.95	2.05	1.75
14	2.5	3.9	2.6	1.7	1.6	1.9	1.95	2.05	1.75
15	2.7	3.6	2.6	1.7	1.6	1.9	1.95	1.95	1.75
16	2.8	3.4	2.6	1.7	1.6	1.8	1.95	1.95	1.75
17	3.0	3.5	2.4	1.7	1.6	1.8	1.95	1.95	1.75
18	3.0	3.3	2.4	1.7	1.6	1.8	1.85	1.95	1.75
19	2.9	3.3	2.3	1.7	1.6	1.8	1.85	1.95	1.75
20	3.4	3.4	2.3	1.7	1.7	1.8	1.85	1.95	1.75
21	3.6	3.4	2.2	1.6	1.7	1.8	1.85	1.95	1.75
22	3.9	3.5	2.2	1.6	1.7	1.8	1.95	1.95	1.65
23	3.9	3.5	2.2	1.6	1.7	1.8	1.95	1.95	1.65
24	4.0	3.8	2.2	1.6	1.8	1.8	1.95	1.95	1.75
25	3.9	3.7	2.1	1.6	1.8	1.8	1.95	1.95	1.65
26	4.1	3.7	2.0	1.6	1.8	1.8	2.15	1.95	1.75
27	4.1	3.5	2.0	1.6	1.8	1.8	1.95	1.85	1.75
28	4.1	3.3	2.0	1.6	1.8	1.8	1.95	1.85	1.75
29	3.8	3.3	2.0	1.6	1.8	1.8	1.85	1.85	1.75
30	3.8	3.3	2.0	1.6	1.8	1.8	1.85	1.85	1.75
31	.....	3.3	.....	1.6	1.9	.....	1.85	.....	1.75

Daily discharge, in second-feet, of Jocko River at Ravalli, Mont., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	235	905	660	180	110	180	167	192	167
2	265	905	705	180	110	180	167	192	167
3	235	905	615	180	110	155	167	192	167
4	235	1,070	615	180	110	180	167	192	167
5	295	1,120	570	180	110	180	167	192	167
6	295	1,070	480	180	110	180	167	192	167
7	365	1,180	525	180	110	180	167	192	167
8	330	1,180	525	155	110	180	167	192	167
9	330	1,240	480	155	110	180	167	192	167
10	400	1,350	480	155	110	180	167	192	167
11	365	1,590	440	155	110	180	192	192	142
12	400	1,290	480	155	110	180	192	220	142
13	365	1,070	400	130	110	180	192	220	142
14	365	1,020	400	130	110	180	192	220	142
15	440	850	400	130	110	180	192	192	142
16	480	750	400	130	110	155	192	192	142
17	570	800	330	130	110	155	192	192	142
18	570	705	330	130	110	155	167	192	142
19	525	705	295	130	110	155	167	192	142
20	750	750	295	130	130	155	167	192	142
21	850	750	265	110	130	155	167	192	142
22	1,020	800	265	110	130	155	192	192	120
23	1,020	800	265	110	130	155	192	192	120
24	1,070	960	265	110	155	155	192	192	142
25	1,020	905	235	110	155	155	192	192	120
26	1,120	905	205	110	155	155	250	192	142
27	1,120	800	205	110	155	155	192	167	142
28	1,120	705	205	110	155	155	192	167	142
29	960	705	205	110	155	155	167	167	142
30	960	705	205	110	155	155	167	167	142
31	.....	705	.....	110	180	.....	167	.....	142

NOTE.—Daily discharge determined from a discharge rating curve fairly well defined below 1,070 second-feet.

Monthly discharge of Jocko River at Ravalli, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 130	7,790	D.
February	.....	.....	[a] 130	7,220	D.
March	.....	.....	[a] 170	10,500	D.
April	1,120	235	602	35,800	B.
May	1,590	705	942	57,900	B.
June	705	205	392	23,300	B.
July	180	110	138	8,480	B.
August	180	110	125	7,690	B.
September	180	155	167	9,940	B.
October	250	167	180	11,100	B.
November	220	167	191	11,400	B.
December	167	120	148	9,100	B.
The period	.....	.....	276	200,000	

[a] Estimated.

BIG KNIFE CREEK NEAR JOCKO, MONT.

Big Knife Creek is a small stream that rises in the mountains and flows westward to its junction with Jocko River, about a mile north of the Jocko Agency.

The gaging station, which is located near the small highway bridge that spans the creek about 2½ miles northeast of Jocko, Mont., was established August 19, 1908.

On August 1, 1910, water was turned into a recently constructed canal about a mile above the original site of the station, and on August 5 a new station was established at a point above the headgates.

The gage at the original station is a staff just above the highway bridge; its datum has not been changed. The channel does not shift except during extremely high stages; all discharge measurements are made by wading.

The creek freezes over in cold weather.

Discharge measurements of Big Knife Creek near Jocko, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section	Gage height.	Discharge
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 5	W. A. Lamb	10	7.2	0.65	10.2
Do.[a]	Do	7.5	5.8	2.19	8.6
Oct. 7[a]	Richards and Jones	6.8	5.1	2.03	7.2

[a] Made at new station above canal headgates.

Daily gage height, in feet, of Big Knife Creek near Jocko, Mont., for 1910.

[Tony Delaware, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1						0.89	0.73	0.56		0.30	
2				0.60							
3								.67		.30	0.67
4					0.78	.85					
5									0.32	.30	.65
6							.73	.66			
7					.85				.30		.64
8						.84		.71		.31	
9				.59			.74				.64
10								.71	.29	.30	
11					1.00	.81	.78				
12	0.60								.30	.30	.67
13					.88		.73				
14									.33		.65
15								.68		.30	
16				.64			.76				.64
17								.67	.34	.30	
18					.73	.81	.74				
19			0.59						.33	.30	.63
20				.76			.74	.66			
21					.73				.33		.63
22						.80		.67		.30	
23				.84			.73				.63
24								.69	.30	.29	
25					.80	.78	.73				
26			.63						.32	.30	.62
27				.88			.73	.54			
28					.90				.29		.62
29						.73		.47		.29	
30				.82			.71				.62
31								.48		.29	

Daily discharge, in second-feet, of Big Knife Creek near Jocko, Mont., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	.....	7.5	8.0	18	22	13	6.4	3.3	1.0	4.0
2	.....	.....	7.5	7.8	17	21	13	8.7	2.7	1.0	7.0
3	.....	.....	7.5	7.8	16	21	13	11	2.2	1.0	10
4	.....	.....	7.5	7.7	15	20	13	11	1.7	1.0	9.8
5	.....	.....	7.5	7.7	16	20	13	10	1.2	1.0	9.7
6	.....	.....	7.5	7.6	18	20	13	10	1.1	1.0	9.5
7	.....	.....	7.5	7.6	20	19	13	11	1.0	1.1	9.3
8	.....	.....	7.5	7.5	23	19	13	12	1.0	1.1	9.3
9	.....	.....	7.5	7.5	26	18	13	12	.9	1.0	9.3
10	.....	.....	7.5	7.7	29	18	14	12	.9	1.0	9.5
11	.....	.....	7.5	7.9	32	17	15	12	1.0	1.0	9.7
12	7.8	.....	7.5	8.1	27	17	14	12	1.0	1.0	10
13	.....	.....	7.5	8.4	22	17	13	11	1.2	1.0	9.8
14	.....	.....	7.5	8.7	21	17	13	11	1.3	1.0	9.7
15	.....	.....	7.5	9.0	19	17	14	11	1.3	1.0	9.5
16	.....	.....	7.5	9.3	17	17	14	10	1.4	1.0	9.3
17	.....	.....	7.5	10	15	17	14	10	1.4	1.0	9.2
18	.....	.....	7.5	11	13	17	13	10	1.4	1.0	9.0
19	.....	.....	7.5	12	13	17	13	10	1.3	1.0	8.9
20	.....	.....	7.7	14	13	16	13	10	1.3	1.0	8.9
21	.....	.....	7.9	16	13	16	13	10	1.3	1.0	8.9
22	.....	.....	8.1	18	14	16	13	10	1.2	1.0	8.9
23	.....	.....	8.3	19	15	16	13	10	1.1	1.0	8.9
24	.....	.....	8.5	20	16	15	13	11	1.0	.9	8.8
25	.....	.....	8.7	21	16	15	13	9.2	1.1	.9	8.7
26	.....	.....	8.9	22	18	15	13	7.5	1.2	1.0	8.6
27	.....	.....	8.7	22	20	14	13	5.8	1.0	1.0	8.6
28	.....	.....	8.5	20	23	13	13	4.8	.9	.9	8.6
29	.....	.....	8.3	19	23	13	12	3.7	.9	.9	8.6
30	.....	.....	8.2	18	23	13	12	3.8	1.0	.9	8.6
31	.....	.....	8.1	.....	22	.....	9.2	3.9	.....	.9	.....

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve.
Aug. 1 to Nov. 1 water diverted into canal above station. Additional records obtained at new station established Aug. 5 above head gate of canal.

Monthly discharge of Big Knife Creek near Jocko, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 7.8	480	D.
February	.....	.....	[a] 7.5	416	D.
March	8.9	7.5	7.82	481	C.
April	22	7.5	12.3	732	B.
May	32	13	19.1	1,170	B.
June	22	13	17.1	1,020	B.
July	15	9.2	13.0	799	B.
August	12	3.7	9.38	577	B.
September	3.3	.9	1.31	78	B.
October	1.1	.9	.99	61	B.
November	10	4.0	8.95	533	B.
December	.....	.....	[a] 8.5	523	D.
The year	.....	.....	9.50	6,870	

[a] Estimated.

Daily gage height, in feet, and discharge, in second-feet, of Big Knife Creek near Jocko, Mont., for 1910.

[Station above canal head gates. Tony Delaware, observer.]

Day.	August.		September.		October.		November.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	.....	8.5	2.04	7.0	.....	6.2
2	.....	.....	.....	8.6	.....	7.2	.....	6.3
3	.....	.....	.....	8.7	2.06	7.3	2.00	6.3
4	.....	.....	.....	8.8	.....	7.2	.....	6.2
5	2.19	9.8	2.14	8.8	2.04	7.0	1.98	6.0
6	.....	9.7	.....	8.7	.....	6.9	.....	6.0
7	.....	9.6	2.13	8.6	.....	6.7	1.97	5.9
8	.....	9.5	.....	8.5	2.02	6.6	.....	6.0
9	.....	9.4	.....	8.3	.....	6.6	1.98	6.0
10	.....	9.3	2.11	8.2	2.02	6.6	.....	6.2
11	.....	9.2	.....	8.1	.....	6.6	.....	6.4
12	.....	9.1	2.10	8.0	2.02	6.6	2.02	6.6
13	.....	9.0	.....	7.8	.....	6.6	.....	6.4
14	.....	9.0	2.08	7.7	.....	6.5	2.00	6.3
15	.....	8.9	.....	7.7	2.01	6.5	.....	6.2
16	.....	8.9	.....	7.7	.....	6.6	1.99	6.2
17	2.14	8.8	2.08	7.7	2.02	6.6	.....	6.1
18	.....	8.8	.....	7.6	.....	6.7	.....	6.0
19	.....	8.8	2.07	7.5	2.03	6.8	1.97	5.9
20	2.14	8.8	.....	7.5	.....	6.6	.....	5.9
21	.....	8.8	2.07	7.5	.....	6.4	1.97	5.9
22	2.14	8.8	.....	7.4	2.00	6.3	.....	5.9
23	.....	8.9	.....	7.3	.....	6.2	1.97	5.9
24	2.15	9.0	2.05	7.2	1.99	6.2	.....	5.8
25	.....	8.9	.....	7.2	.....	6.2	.....	5.6
26	.....	8.8	2.05	7.2	2.00	6.3	1.94	5.5
27	2.13	8.6	.....	7.1	.....	6.3	.....	5.5
28	.....	8.7	2.04	7.0	.....	6.2	1.94	5.5
29	2.14	8.8	.....	7.0	1.99	6.2	.....	5.5
30	.....	8.6	.....	7.0	.....	6.2	1.94	5.5
31	2.12	8.4	.....	.....	1.99	6.2	.....	.....

NOTE.—Daily discharge determined from a rating curve that is fairly well-defined.

Monthly discharge of Big Knife Creek near Jocko, Mont., for 1910.

[Station above canal head gates.]

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy
	Maximum.	Minimum.	Mean.		
August 5–31	9.8	8.4	9.00	482	B.
September	8.8	7.0	7.83	466	B.
October	7.3	6.2	6.58	405	B.
November	6.6	5.5	5.99	356	B.
December	.....	.....	[a] 5.00	307	D.

[a] Estimated.

AGENCY CREEK NEAR JOCKO, MONT.

Agency Creek is a small stream that rises in the Mission Range and flows westward to its junction with Jocko River near Agency. It derives its water chiefly from the melting snow in the mountains and flows rapidly down a steep grade. It partly freezes over during the winter months.

The gaging station, which is located about 2 miles east of Jocko, just above the intake of the Matt ditch, was established August 19, 1908.

The Matt ditch is the largest leaving the stream; smaller ditches take water below the station.

A small staff gage is used and all measurements are made by wading.

Discharge measurements of Agency Creek near Jocko, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	Raymond Richards	19	14	1.48	29
June 22	do	18	12	1.10	18
Aug. 20	G. L. Sperry	3.8	3.3	.67	4.8
Oct. 7	Raymond Richards	18.5	7.8	.67	4.8

Daily gage height, in feet, of Agency Creek near Jocko, Mont., for 1910.

[Tony Delaware, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				1.70		0.75		0.61	
2		0.65			1.00				
3						.73		.66	0.68
4			1.32	1.40					
5							0.76	.67	.66
6					.95	.73			
7			1.70				.72		.62
8				1.44		.72		.66	
9		.71			.94				.63
10						.71	.70	.64	
11			2.00	1.50	.90				
12							.67	.63	.82
13			1.78		.89				
14							.66		.75
15						.69		.62	
16		.90			.87				.72
17						.68	.66	.63	
18			1.50	1.30	.84				
19	0.72						.65	.59	.70
20		1.53			.83	.67			
21			1.44				.65		.71
22				1.13		.67		.62	
23		1.19			.81				.67
24						.70	.62	.62	
25			1.80	1.13	.80				
26	.79						.63	.64	.63
27		1.85			.79	.67			
28			1.61				.62		.63
29				1.08		.69		.69	
30		1.50			.76				.62
31						.66		.68	

Daily discharge, in second-feet, of Agency Creek near Jocko, Mont., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	5.0	28	41	13	6.5	5.3	4.4	5.3
2	.....	5.0	27	36	12	6.3	5.5	4.7	5.3
3	.....	5.0	25	31	12	6.1	5.9	5.1	5.3
4	.....	5.2	23	26	12	6.1	6.3	5.2	5.2
5	.....	5.3	29	26	11	6.1	6.7	5.2	5.1
6	.....	5.4	35	27	11	6.1	6.4	5.2	4.8
7	.....	5.5	41	28	11	6.0	6.0	5.1	4.6
8	.....	5.6	45	28	11	6.0	5.9	5.1	4.6
9	.....	5.8	50	29	11	5.9	5.7	4.9	4.7
10	.....	6.4	55	29	10	5.8	5.6	4.8	5.7
11	.....	7.0	60	30	9.6	5.8	5.4	4.8	6.8
12	.....	7.6	53	29	9.5	5.7	5.2	4.7	7.8
13	.....	8.1	46	28	9.4	5.6	5.2	4.7	7.1
14	.....	8.6	42	26	9.2	5.5	5.1	4.6	6.5
15	.....	9.1	39	25	9.1	5.5	5.1	4.6	6.3
16	.....	9.6	36	24	8.9	5.4	5.1	4.6	6.0
17	.....	15	33	23	8.6	5.3	5.1	4.7	5.9
18	.....	21	30	22	8.4	5.3	5.0	4.5	5.7
19	6.0	26	29	20	8.2	5.2	5.0	4.2	5.6
20	.....	32	29	18	8.1	5.2	5.0	4.3	5.7
21	.....	27	28	17	7.9	5.2	5.0	4.5	5.8
22	.....	22	33	16	7.8	5.2	4.9	4.6	5.5
23	.....	18	38	16	7.6	5.4	4.7	4.6	5.2
24	.....	26	42	16	7.5	5.6	4.6	4.6	5.0
25	.....	34	47	16	7.4	5.4	4.6	4.7	4.9
26	7.2	42	44	16	7.3	5.3	4.7	4.8	4.7
27	.....	50	40	15	7.2	5.2	4.6	5.0	4.7
28	.....	44	36	14	7.0	5.3	4.6	5.3	4.7
29	.....	37	37	14	6.8	5.5	4.6	5.5	4.6
30	.....	30	38	13	6.7	5.3	4.5	5.4	4.6
31	.....	.....	39	.....	6.6	5.1	.....	5.3	.....

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve. For discharges above 15 second-feet the 1909 dischage rating curve is used.

Monthly discharge of Agency Creek near Jocko, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 6	369	D.
February	.....	.....	[a] 6	333	D.
March	.....	.....	[a] 6.5	400	D.
April	50	5.0	17.6	1,050	B.
May	60	23	38.0	2,340	B.
June	41	13	23.3	1,390	B.
July	13	6.6	9.12	561	B.
August	6.5	5.1	5.61	345	B.
September	6.7	4.5	5.24	312	B.
October	5.5	4.2	4.83	297	B.
November	7.8	4.6	5.46	325	B.
December	.....	.....	[a] 5	307	D.
The year	60	.....	11.1	8,030	

[a] Estimated.

BLODGETT CREEK NEAR JOCKO, MONT.

Blodgett Creek is a very small stream that rises in the Mission Range and flows into Agency Creek.

The gaging station, which is located about 1½ miles northeast of Jocko, Mont., was established May 22, 1909.

A staff gage is fastened to the left bank. All measurements are made by wading.

The discharge measurements and gage height records indicate that the flow is fairly constant throughout the year. In 1910 the creek carried approximately 365 acre-feet of water.

Discharge measurements of Blodgett Creek near Jocko, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	Raymond Richards	3.0	0.7	0.55	0.5
May 30	W. A. Lamb	2.5	.6	.61	.5
June 22	Raymond Richards	2.5	.65	.60	.59
Aug. 20	G. L. Sperry	1.0	.25	.54	.14

Daily gage height, in feet, of Blodgett Creek near Jocko, Mont., for 1910.

[Tony Delaware, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				0.62		0.55		0.53	
2		0.50			0.59				
3						.57		.53	0.53
4			0.57	.62					
5							0.55	.53	.52
6					.58	.57			
7			.58				.55		.52
8				.63		.56		.52	
9		.50			.59				.52
10						.56	.54	.52	
11			.50	.61	.59				
12							.56	.52	.55
13			.50		.59				
14							.54		.53
15						.55		.52	
16		.53			.58				.53
17						.54	.53	.52	
18			.50	.60	.58				
19	0.52						.53	.52	.52
20		.53			.58	.54			
21			.52				.53		.52
22				.60		.53		.52	
23		.54			.58				.52
24						.54	.53	.52	
25			.52	.60	.57				
26	.51						.53	.53	.52
27		.59			.56	.53			
28			.52				.53		.52
29				.59		.54		.52	
30		.57			.55				.52
31						.53		.52	

FINLEY CREEK NEAR JOCKO, MONT.

Finley Creek, a tributary of Jocko River, is formed by its East and West forks, which rise in the Mission Range and unite about one-eighth mile above the gaging station.

The station, which is located at the ford 2½ miles south of Jocko and 3½ miles east of Arlee, and is 300 feet south of the Northern Pacific Railway, was established August 19, 1908. No ditches of importance are diverted from this creek.

A staff gage is nailed to a tree on the right bank near the ford; its datum has remained unchanged. The stream freezes over in the winter. All discharge measurements are made by wading near the ford.

Discharge measurements of Finley Creek near Jocko, Mont., 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	Raymond Richards	21	22	1.74	70
May 30	W. A. Lamb	18	13	1.60	31
June 23	Raymond Richards	16	12	1.48	20
Aug. 20	G. L. Sperry	13	11	1.19	4.3
Oct. 7	Raymond Richards	10	5.8	1.28	7.4

Daily gage height, in feet, of Finley Creek near Jocko, Mont., for 1910.

[Tony Delaware, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				1.64	1.34	1.23		1.26	
2		1.59							
3						1.23		1.29	1.29
4			1.64	1.57					
5							1.26	1.29	1.28
6					1.32	1.22			
7			1.73				1.27		1.28
8				1.55		1.22		1.28	
9		1.47			1.32				1.29
10						1.19	1.24	1.27	
11			1.91	1.53	1.29				
12							1.25	1.27	1.34
13			1.77		1.29				
14							1.23		1.32
25						1.21		1.28	
16		1.66			1.27				1.31
17						1.21	1.23	1.28	
18			1.67	1.50	1.27				
19	1.66						1.24	1.29	1.30
20		1.74			1.27	1.19			
21			1.65				1.26		1.34
22				1.44		1.19		1.28	
23		1.78			1.27				1.33
24						1.21	1.25	1.27	
25			1.71	1.41					
26	1.73						1.27	1.29	1.30
27		1.97			1.25	1.21			
28			1.67				1.27		1.29
29				1.37		1.22		1.28	
30		1.74			1.23				1.30
31						1.20		1.29	

Daily discharge, in second-feet, of Finley Creek near Jocko, Mont., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	34	60	43	11	6.2	5.0	7.4	8.6
2	.....	34	54	39	11	6.2	6.0	8.0	8.6
3	.....	32	48	35	11	6.2	7.0	8.6	8.6
4	.....	30	43	31	10	5.9	7.2	8.6	8.4
5	.....	28	53	30	10	5.9	7.4	8.6	8.2
6	.....	26	53	30	10	5.8	7.6	8.4	8.2
7	.....	24	63	29	10	5.8	7.8	8.4	8.2
8	.....	22	76	28	10	5.8	7.2	8.2	8.4
9	.....	20	89	27	10	5.3	7.2	8.0	8.6
10	.....	24	102	27	9.5	4.7	6.6	7.8	9
11	.....	28	115	26	8.6	4.8	6.8	7.8	10
12	.....	32	94	25	8.6	5.0	7.0	7.8	11
13	.....	36	73	24	8.6	5.2	6.6	8.0	10
14	.....	40	70	24	8.2	5.2	6.2	8.0	10
15	.....	44	65	23	8.2	5.4	6.2	8.2	10
16	.....	47	60	23	7.8	5.4	6.2	8.2	9.5
17	.....	51	55	22	7.8	5.4	6.2	8.2	9.2
18	.....	56	49	22	7.8	5.1	6.4	8.4	9.3
19	47	60	48	20	7.8	4.9	6.6	8.6	9
20	.....	65	46	19	7.8	4.7	7.0	8.4	10
21	.....	70	45	18	7.8	4.7	7.4	8.4	11
22	.....	70	48	17	7.8	4.7	7.2	8.2	10
23	.....	76	51	16	7.8	5.0	7.2	8.0	10
24	.....	88	54	16	7.7	5.4	7.0	7.8	10
25	.....	106	58	15	7.5	5.4	7.4	8.2	9
26	63	121	55	14	7.2	5.4	7.8	8.6	9
27	.....	136	52	13	7.0	5.4	7.8	8.4	8.8
28	.....	110	49	13	6.8	5.6	7.8	8.4	8.6
29	.....	85	48	12	6.4	5.8	7.6	8.2	8.8
30	.....	65	46	12	6.2	5.4	7.6	8.4	9
31	.....	.....	45	.....	6.2	5.0	.....	8.6	.....

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve. Discharge interpolated for days on which gage was not read.

Monthly discharge of Finley Creek near Jocko, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	136	20	55.3	3,290	B.
May	115	43	60.2	3,700	B.
June	43	12	23.1	1,370	B.
July	11	6.2	8.45	520	B.
August	6.2	4.7	5.38	331	B.
September	7.8	5.0	6.97	415	B.
October	8.6	7.4	8.22	505	B.
November	11	8.2	9.23	549	B.
The period	.....	.....	.....	10,700	

EAST FINLEY CREEK NEAR JOCKO, MONT.

East Finley, a small creek rising in the Mission Range and fed by melting snow in the mountains, unites with the West Fork to form Finley Creek.

The station, which is located just above the intake of the Indian ditch, 4 miles southeast of Jocko, 4½ miles east of Arlee, was estab-

lished August 18, 1908. Indian ditch is the only diversion, and at low water takes practically the entire flow of the stream.

The staff gage is permanent, and its datum has remained unchanged. Measurements are made by wading.

Discharge measurements of East Finley Creek near Jocko, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	Raymond Richards	14	14	2.02	35
May 20	W. A. Lamb	10	14	1.90	22
June 23	Raymond Richards	14	9.8	1.74	18
Aug. 20	G. L. Sperry	3.5	3.6	1.33	3.3
Oct. 7	Raymond Richards	9	6.2	1.38	5.5

Daily gage height, in feet, of East Finley Creek near Jocko, Mont., for 1910.

[Tony Delaware, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				2.08		1.38		1.30	
2		1.46			1.61				
3						1.37		1.33	1.40
4			1.87	1.87					
5							1.43	1.39	1.38
6					1.55	1.37			
7			2.16				1.41		1.37
8				1.88		1.35		1.39	
9		1.43			1.54				1.37
10						1.34	1.39	1.40	
11			2.50	1.88	1.50				
12							1.37	1.39	1.44
13			2.11		1.50				
14							1.35		1.45
15						1.33		1.39	
16		1.52			1.48				1.44
17						1.33	1.34	1.36	
18			1.93	1.85	1.46				
19	1.38						1.33	1.38	1.43
20		2.01			1.45	1.33			
21			1.90				1.34		1.42
22				1.73		1.33		1.37	
23		1.89			1.43				1.42
24						1.34	1.31	1.37	
25			2.18	1.70	1.43				
26	1.59						1.32	1.40	1.40
27		2.33			1.41	1.33			
28			2.04				1.32		1.39
29				1.67		1.34		1.40	
30		1.95			1.39				1.37
31						1.33		1.40	

Daily discharge, in second-feet, of East Finley Creek near Jocko, Mont., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	5.0	7.0	30	39	12	5.1	4.5	3.5	5.5
2	5.0	7.1	28	34	11	5.0	4.9	3.8	5.5
3	5.0	7.0	25	29	11	4.9	5.4	4.1	5.5
4	5.0	7.0	24	24	10	4.9	5.8	4.7	5.3
5	5.0	7.0	31	24	9.9	4.9	6.3	5.3	5.1
6	5.0	6.5	38	24	9.6	4.9	6.0	5.3	5.0
7	5.0	6.5	46	25	9.5	4.7	5.8	5.3	4.9
8	5.0	6.5	55	25	9.4	4.5	5.7	5.3	4.9
9	5.0	6.3	65	25	9.3	4.4	5.5	5.4	4.9
10	5.0	6.5	75	25	8.7	4.3	5.3	5.5	5.4
11	5.0	7.0	85	25	8.2	4.3	5.1	5.4	6.0
12	5.0	7.5	63	25	8.2	4.2	4.9	5.3	6.6
13	5.0	8.0	41	25	8.2	4.2	4.7	5.3	6.8
14	5.0	8.5	40	24	8.0	4.1	4.5	5.3	6.9
15	5.0	8.5	35	24	7.9	4.1	4.4	5.3	6.8
16	5.0	8.8	35	23	7.7	4.1	4.4	5.0	6.6
17	5.0	15	30	23	7.4	4.1	4.3	4.7	6.5
18	5.0	21	28	23	7.1	4.1	4.2	4.9	6.4
19	5.1	27	27	21	7.0	4.1	4.1	5.1	6.3
20	6	34	27	19	6.9	4.1	4.2	5.0	6.2
21	7	31	26	17	6.7	4.1	4.3	4.9	6.0
22	8	28	32	16	6.5	4.1	4.1	4.9	6.0
23	9	25	38	16	6.3	4.2	3.9	4.9	6.0
24	10	35	45	15	6.3	4.3	3.7	4.9	5.9
25	11	45	48	15	6.8	4.2	3.8	5.2	5.7
26	11	55	44	15	6.0	4.2	3.9	5.5	5.5
27	11	64	40	14	5.8	4.1	3.9	5.5	5.4
28	10	53	36	14	5.6	4.2	3.9	5.5	5.3
29	9	42	37	14	5.4	4.3	3.7	5.5	5.1
30	8	30	38	13	5.3	4.2	3.6	5.5	4.9
31	7	.....	38	.....	5.2	4.1	.....	5.5	.....

NOTE.—Daily discharge determined from a discharge rating curve that is fairly well defined. Discharge estimated, Mar. 1-18. Discharge interpolated for days after Mar. 18 on which gage heights were not recorded.

Monthly discharge of East Finley Creek near Jocko, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 5.0	307	D.
February	.....	.....	[a] 5.0	278	D.
March	11	5.0	6.52	401	C.
April	64	6.3	20.7	1,230	B.
May	85	24	40.3	2,480	B.
June	39	13	21.8	1,300	B.
July	12	5.2	7.82	481	B.
August	5.1	4.1	4.35	267	B.
September	6.3	3.6	4.63	276	B.
October	5.5	3.5	5.07	312	B.
November	6.9	4.9	5.76	343	B.
December	.....	.....	[a] 5.0	307	D.
The year	85	.....	11.0	7,980	

[a] Estimated.

INDIAN DITCH NEAR JOCKO, MONT.

Indian Ditch takes water from East Finley Creek. It is about 4 miles long and irrigates land in the vicinity of Jocko Agency.

The gaging station, which is located on the ditch just below its intake, 50 feet below the East Finley gage, was established August 18, 1908.

A staff gage is in the flume and measurements can be made there or in the ditch.

Discharge measurements of Indian ditch near Jocko, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	Raymond Richards	5	3.8	0.81	18.8
May 30	W. A. Lamb	5	3.4	.65	17.1
June 23	Raymond Richards	7	5.2	.75	11.5
Aug. 20	G. L. Sperry	6	2.4	.37	3.4
Oct. 6	Raymond Richards	6	2.5	.39	3.6

Daily gage height, in feet, of Indian ditch near Jocko, Mont., for 1910.

[Tony Delaware, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				0.80		0.44		0.37	
2		0.33			0.68				
3						.44		.37	0.43
4			0.67	.82					
5							0.47	.43	.42
6					.60	.40			
7			.70				.45		.41
8				.89		.40		.43	
9		.20			.59				.40
10						.34	.44	.43	
11			.74	.89	.55				
12							.42	.42	.47
13			.70		.55				
14							.40		.48
15						.39		.42	
16		.51			.52				.47
17						.38	39	.40	
18			.65	.87	.51				
19	0.25						.38	.42	.46
20		.83			.50	.37			
21			.65				.38		.45
22				.74		.37		.41	
23		.75			.50				.45
24						.38	.37	.41	
25			.78	.77	.48				
26	.44						.37	.43	.43
27		.92			.47	.31			
28			.75				.37		.43
29				.70		.38		.43	
30		.83			.45				.42
31						.37		.43	

Daily discharge, in second-feet, of Indian ditch near Jocko, Mont., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.8	18	18	13	5.3	4.1	3.6	5.1
2	.....	2.8	16	18	13	5.3	4.6	3.6	5.1
3	.....	2.4	15	19	13	5.3	5.1	3.6	5.1
4	.....	2.1	13	19	12	5.0	5.6	4.4	5.0
5	.....	1.8	13	20	11	4.6	6.2	5.1	4.8
6	.....	1.6	14	21	10	4.3	5.9	5.1	4.7
7	.....	1.4	14	22	9.9	4.3	5.6	5.1	4.6
8	.....	1.2	14	22	9.8	4.3	5.5	5.1	4.4
9	.....	1.0	15	22	9.7	3.6	5.4	5.1	4.3
10	.....	2.0	16	22	9.0	3.0	5.3	5.1	4.9
11	.....	3.0	16	22	8.4	3.2	5.0	5.0	5.5
12	.....	4.0	15	22	8.4	3.4	4.8	4.8	6.2
13	.....	5.0	14	22	8.4	3.6	4.6	4.8	6.3
14	.....	6.0	14	22	8.1	3.8	4.3	4.8	6.4
15	.....	6.6	13	22	7.8	4.1	4.2	4.8	6.3
16	.....	7.2	13	22	7.5	4.0	4.2	4.6	6.2
17	.....	10	12	22	7.4	3.9	4.1	4.3	6.1
18	.....	13	12	22	7.2	3.8	4.0	4.6	6.0
19	1.6	16	12	20	7.0	3.7	3.9	4.8	5.9
20	.....	20	12	18	6.9	3.6	3.9	4.7	5.8
21	.....	18	12	17	6.9	3.6	3.9	4.7	5.6
22	.....	17	14	16	6.9	3.6	3.8	4.6	5.6
23	.....	16	15	16	6.9	3.8	3.7	4.6	5.6
24	.....	18	16	17	6.6	3.9	3.6	4.6	5.5
25	.....	20	17	17	6.4	3.4	3.6	4.8	5.3
26	5.3	22	17	17	6.3	2.9	3.6	5.1	5.1
27	.....	24	16	16	6.2	2.3	3.6	5.1	5.1
28	.....	23	16	15	6.0	3.1	3.6	5.1	5.1
29	.....	22	16	14	5.8	3.9	3.6	5.1	5.0
30	.....	20	17	14	5.6	3.8	3.6	5.1	4.8
31	.....	.....	17	.....	5.4	3.6	.....	5.1	.....

NOTE.—Daily discharge determined from a discharge rating curve that is fairly well defined.

Monthly discharge of Indian ditch near Jocko, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	24	1.0	10.3	613	C.
May	18	12	14.6	898	C.
June	22	14	19.2	1,140	C.
July	13	5.4	8.28	509	C.
August	5.3	2.3	3.87	238	C.
September	6.2	3.6	4.43	264	C.
October	5.1	3.6	4.74	291	C.
November	6.4	4.3	5.38	320	C.
The period	.....	.....	.....	4,270	

VALLEY CREEK NEAR RAVALLI, MONT.

Valley Creek is a tributary to Jocko River.

The gaging station, which is located near the mouth of the stream, at the crossing of the highway between Jocko and Ravalli, about 3 miles east of Ravalli and 8 miles west of Arlee, was established August 20, 1908.

A staff gage is located on the left bank of the stream above the bridge. Discharge measurements are made by wading.

Discharge measurements of Valley Creek near Ravalli, Mont., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft*	*Feet.*	*Sec.-ft.*
Apr. 19	Raymond Richards	21	51	2.00	108
May 29	W. A. Lamb	18	42	1.80	71
June 22	Raymond Richards	19	22	1.49	42
Aug. 4	R. H. Bolster	18	32	1.23	17
Oct. 6	B. E. Jones	18	14	1.21	15

Daily gage height, in feet, and discharge, in second-feet, of Valley Creek near Ravalli, Mont., for 1910.

[John Morrigeau, observer.]

Day.	March.		April.		May.		June.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	1.58	43	2.10	128	1.85	79
2	.....	.....	1.55	40	2.03	114	1.74	63
3	.....	.....	1.65	51	2.05	118	1.77	67
4	.....	.....	1.55	40	2.00	108	1.70	57
5	.....	.....	1.60	45	2.05	118	1.73	61
6	.....	.....	1.55	40	2.00	108	1.65	51
7	.....	.....	1.55	40	2.10	128	1.65	51
8	.....	.....	1.60	45	2.10	128	1.68	55
9	.....	.....	1.65	51	2.15	139	1.58	43
10	.....	.....	.....	65	2.25	161	1.63	49
11	.....	.....	1.85	79	2.25	161	1.57	42
12	.....	.....	1.95	98	2.20	150	1.55	40
13	.....	.....	2.05	118	2.20	150	1.60	45
14	.....	.....	2.00	108	2.10	128	1.53	38
15	.....	.....	2.00	108	2.05	118	1.58	43
16	.....	.....	1.90	88	2.00	108	1.50	35
17	.....	.....	1.90	88	1.95	98	1.55	40
18	.....	.....	1.95	98	2.00	108	1.55	40
19	.....	.....	1.95	98	1.90	88	1.50	35
20	1.75	64	2.15	139	1.95	98	1.53	38
21	1.85	79	2.13	135	1.85	79	1.48	33
22	1.95	98	2.00	108	1.85	79	1.45	31
23	2.10	128	2.15	139	1.90	88	1.48	33
24	1.95	98	2.10	128	1.85	79	1.41	28
25	1.95	98	2.20	150	1.90	88	1.46	32
26	1.75	64	2.30	172	1.85	79	1.41	28
27	1.75	64	2.30	172	1.90	88	1.40	27
28	1.75	64	2.30	172	1.85	79	1.45	31
29	1.65	51	2.22	154	1.78	68	1.39	26
30	1.75	64	2.20	150	1.80	71	1.43	29
31	1.60	45	.....	.....	1.75	64	.....	.....

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve. No records after June 30, as observer could not be obtained.

Monthly discharge of Valley Creek near Ravalli, Mont., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 20–31	128	45	76.4	1,820	B.
April	172	40	98.7	5,870	B.
May	161	64	107	6,580	B.
June	79	26	42.3	2,520	B.

PRIEST RIVER BASIN.

GENERAL FEATURES.

Priest River rises in the extreme northwestern part of Bonner County, Idaho, and flows southward, passing through Priest Lake to its junction with Clark Fork at the town of Priest River, about 12 miles southwest of the point at which the latter stream emerges from Lake Pend Oreille. The river is about 50 miles long and its tributaries are short streams draining a mountainous country. The fall of the river is large and the lake affords an excellent storage reservoir.

PRIEST RIVER AT PRIEST RIVER, IDAHO.

This gaging station, which is located near the mouth of the stream at the highway bridge on the road from the railway station at Priest River to Priest Lake, was established June 28, 1903, discontinued April 30, 1905, and reestablished November 17, 1910.

A vertical staff gage is fastened to the pier of the bridge from which discharge measurements are made; the datum of this gage is the same as that of the gage originally used.

The relation between gage height and discharge is affected by ice during the winter months, by occasional backwater from log jams, and possibly also by backwater from Clark Fork. The current at the measuring section is uneven. Conditions for accurately determining discharge are only fair.

The following discharge measurement was made by F. C. Ebert:

November 17, 1910: Width, 115 feet; area, 380 square feet; gage height, 3.70 feet: discharge, 918 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of Priest River at Priest River, Idaho, for 1910.

[P. A. Finstad, observer.]

Day.	November.		December.		Day.	November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1			4.6	1,650	16			3.8	980
2			4.9	1,980	17	3.7	920	4.0	1,120
3			4.5	1,550	18	3.6	860	4.1	1,200
4			3.9	1,050	19	4.7	1,750	4.0	1,120
5			4.0	1,120	20	3.9	1,050	3.9	1,050
6			3.8	980	21	4.9	1,980	4.0	1,120
7			4.1	1,200	22	5.0	2,100	4.0	1,120
8			4.0	1,120	23	4.5	1,550	4.0	1,120
9			4.2	1,280	24	4.8	1,860	3.8	980
10			4.0	1,120	25	5.9	3,250	3.9	1,050
11			4.2	1,280	26	5.0	2,100	3.9	1,050
12			4.0	1,120	27	4.0	1,120	3.6	860
13			4.0	1,120	28	3.5	810	3.7	920
14			3.9	1,050	29	4.0	1,120	3.7	920
15			3.7	920	30	3.7	920	3.6	860
					31			3.6	860

NOTE.—No ice reported at this station. Daily discharge determined from a well defined discharge rating curve.

Monthly discharge of Priest River at Priest River, Idaho, for 1910.

[Drainage area, 904 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
Nov. 18-30	3,250	860	1,530	1.69	0.88	42,500	B.
December	1,980	860	1,120	1.24	1.43	68,900	B.

KOOTENAI RIVER BASIN.

GENERAL FEATURES.

Kootenai River rises in central Alberta, Canada, flows southward for 150 miles in Canada, 50 miles in northwestern Montana, turns to the northwest at Jennings, Mont., and again to the north near Bonners Ferry, Idaho, to Kootenai Lake, and finally joins the main fork of the Columbia in British Columbia. The basin is as a whole mountainous, the peaks in the divide separating it from the basin of the South Saskatchawan on the east ranging from 10,000 to 12,000 feet above sea level; the average elevation of the divide between the basin of the Kootenai and that of the Clark Fork on the south is about 6,500 feet above sea level. The mountains are cut by many low passes, are interspersed with mountain meadows and are well covered with timber. On the north side of the divide between the Kootenai and Clark Fork are several small glaciers, and other glaceirs and snow fields exist within the part of the basin that is in British Columbia.

The only valley within the area is that known as Tobacco Plains, near Rexford, on the Great Northern Railway. This valley is 3 to 10 miles wide and approximately 20 miles long and its average elevation is 2,500 feet above sea level.

The bottom land adjoining the river is narrow and the stream is little used for irrigation. The small creeks emptying into the river from both sides can be utilized for irrigation in favorable localities.

The most important power site on the Kootenai is at Kootenai Falls, between Libby and Troy, Mont. The utilization of this site by a 30,000-horsepower plant is under consideration.

KOOTENAI RIVER AT LIBBY, MONT.

This station, which is located on the highway bridge opposite the Great Northern Railway station at Libby, Mont., in sec. 3, T. 20 N., R. 31 W., about one-fourth mile from the town and the post office, was established October 13, 1910.

A standard chain gage is attached to the left span of the highway bridge. Previous to the installation of the gage use was made of a

temporary staff gage fastened to an old stump near the bridge. The old gage was removed and record of flood stages was kept for several years by an engineer in Libby, but the gage on which he made his readings was removed before the present gage was established and its datum has not been ascertained.

The bed of the stream is composed of small rocks, the cross section is uniform, the current is fairly swift and well distributed, and the channel is permanent.

Discharge measurements prior to the erection of the bridge were made from the ferry cable, the use of which was discontinued on the completion of the bridge.

The relation between gage height and discharge during the winter months is seriously affected by ice. The accuracy of the records is rated as fair.

The following discharge measurement was made by J. C. Beebe:

October 13, 1910: Width, 485 feet; area, 2,690 square feet; gage height, 2.88 feet; discharge, 11,300 second-feet.

Daily gage height, in feet, of Kootenai River at Libby, Mont., for 1910.

[L. R. Bock, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	1.9	1.3	11	.....	2.7	1.1	21	2.3	2.2	.....
2	.....	1.8	1.3	12	.....	2.6	1.0	22	2.2	2.4	.....
3	.....	1.7	1.4	13	2.8	2.6	.9	23	2.5	2.3	.....
4	.....	1.7	1.3	14	2.7	2.7	.....	24	2.0	2.2	.....
5	.....	1.6	1.4	15	2.6	2.7	.....	25	2.0	1.9	.....
6	.....	1.6	1.4	16	2.4	2.1	.....	26	2.3	1.8	.....
7	.....	1.5	1.2	17	2.4	1.8	.....	27	2.4	1.7	.....
8	.....	1.8	1.2	18	2.5	1.8	.....	28	2.3	1.5	.....
9	.....	2.1	1.2	19	2.5	2.0	.....	29	2.3	1.5	.....
10	.....	2.1	1.1	20	2.4	2.1	.....	30	2.0	1.4	.....
								31	1.9	.....	.....

YAAK CREEK NEAR TROY, MONT.

Yaak Creek rises in T. 37 N., R. 24 W., flows westward 30 miles, then southward 20 miles, and discharges into Kootenai River 10 miles below Troy, Mont., in sec. 5, T. 32 N., R. 34 W. The basin is forested and mountainous and, with the exception of a small area in southern Canada, is entirely in the Kootenai National Forest. The flow is derived from melting snow during the summer and from springs throughout the year. Several tributaries, all comparatively small, flow from the mountains to the creek. The stream affords excellent opportunities for power development.

The gaging station, which is located about one-half mile above Yaak Falls and bridge on the right side of the creek near the south line of sec. 33, T. 34 N., R. 33 W., was established October 15, 1910.

No water is now diverted from this creek, but a ditch is planned that will take water from a point near the gage and carry it below the falls for the development of power to be used in mining.

The drainage area above the station comprises 930 square miles.

The gage is a vertical staff.

The bed of the stream is composed of bowlders, is very rough, and probably permanent.

Discharge measurements are made by wading below the gage or from a cable.

The relation between gage height and discharge during the winter months is seriously affected by ice. At present the record must be rated as very poor.

The following discharge measurement was made by J. C. Beebe:

October 15, 1910: Width, 78 feet; area, 95 square feet; gage height, 0.88 feet; discharge, 232 second-feet.

Daily gage height, in feet, of Yaak River near Troy, Mont., for 1910.

[C. S. Dennis, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1		0.66		11				21			
2				12				22	.64	3.00	
3				13		1.65		23			
4			1.05	14				24			
5				15	0.88	2.45		25			
6		.98		16				26			1.15
7				17				27		2.00	
8				18				28			
9				19		1.15	1.30	29			
10				20				30			
								31			

SPOKANE RIVER BASIN.

GENERAL FEATURES.

Spokane River rises in Cœur d'Alene Lake in western Idaho, flows west and northwest, and discharges into Columbia River at Fort Spokane, Wash. The principal tributaries received between the lake and the Columbia are Lattah or Hangman Creek, which enters the stream from the south near Spokane, Wash.; Little Spokane River, which comes in from the north about 12 miles below Spokane; and Chamokane Creek, which is tributary from the north and forms the eastern boundary of the Spokane Indian Reservation. Its drainage area comprises about 5,880 square miles. Nearly all of the upper portion is heavily forested and a large area is included in the Cœur d'Alene National Forest.

The topography of the country is rugged and broken. The valley's sides are very steep and many of the peaks rise to regions of perpetual snow.

The mean annual rainfall at Spokane is 17 inches; at St. Maries, 20 inches; and on the summit of the Cœur d'Alene Mountains it is probably 50 inches or more. A large portion of the precipitation, particularly at the higher altitudes, is in the form of snow whose gradual melting helps to feed the streams during the summer season. Occasionally the snow banks are melted suddenly by chinook winds, and when these winds are accompanied by heavy rainfall the flood damage is sometimes great, although its severity is mitigated to a large extent by the natural storage in Cœur d'Alene Lake.

The lands bordering Spokane River are for the most part agricultural. Above Spokane the valley is comparatively wide and level and is underlain throughout with coarse gravel that affords ample ground-water storage from which a liberal supply for irrigation can be drawn. A gravity system diverts water from the right bank of Spokane River at Post Falls. Below Spokane, where the river flows in a comparatively deep canyon, the agricultural lands consist of narrow strips along the river banks and are irrigated for the most part by pumping from the river. The lands flanking the canyon of Spokane River are high and are used extensively for wheat raising. The chief products of the region, however, are from its mines.

Cœur d'Alene Lake, which receives the drainage from the western slope of the Cœur d'Alene Mountains, occupies a wide valley between two ranges of mountains. Its upper end is within the Cœur d'Alene Indian Reservation. The lands bordering it are for the most part low and swampy, and the lake itself is being gradually filled by sediment brought in by St. Joseph and Cœur d'Alene rivers, its principal tributaries. Undoubtedly the lake once extended a considerable distance up the valleys of these streams, and for 15 or 20 miles above their mouths the bottom lands are subject annually to overflow, except where the rivers are artificially confined in their channels. Along the immediate banks of the streams the land is relatively higher than that nearer the hills. The channels of the rivers are comparatively deep and are favorable for navigation. The valleys are used more or less for agriculture.

The Spokane affords a large amount of power. At Post Falls, 8 miles below the outlet of Cœur d'Alene Lake, the Washington Water Power Co. has constructed a dam and power plant. The crest of this dam is at elevation 2,116.5 feet above sea level and is provided with a bear-trap dam 100 feet in length by means of which the water can be raised 10 feet above the crest proper. There are also eight Tainter gates which, when opened, afford an additional spillway length of 159 feet. The company's overflow privileges do not allow them to raise the height of water in Cœur d'Alene Lake above an elevation of 2,126 feet. During floods, therefore, the Tainter gates

are opened and the bear-trap dam is lowered in order to afford as large capacity of outflow as possible. When the water falls to an elevation of 2,126 feet in the lake the bear trap is raised, and the Tainter gates are manipulated to maintain the water at this point as nearly as possible. The waters so stored are released through the power houses. The Post Falls plant of the Washington Water Power Co. has a nominal capacity of 15,000 horsepower; the Spokane plant, 12,000 horsepower. The Nine-Mile plant of the Inland Empire Railway Co. has a capacity of 10,000 horsepower. The Washington Water Power Co. is just completing a plant at Little Falls for a development of 20,000 horsepower, and has another under construction at Long Lake between Nine-Mile and Little Falls. Another plant is projected at a favorable point 14 miles below Little Falls, and still another at the Narrows at the mouth of the river near Fort Spokane. At both places plants of 20,000 horsepower capacity could be constructed.

CŒUR D'ALENE LAKE AT CŒUR D'ALENE, IDAHO.

A gage was established in this lake February 15, 1905, at Cœur d'Alene, Idaho, by the United States Geological Survey. The records were suspended on September 30, 1905, by the Survey, but the Washington Water Power Co. has maintained gage readings here since that time. Since April 26, 1903, the St. Joe Boom Co. has kept gage records at its sorting gap at Chatcolet, at the mouth of St. Joe River.

The zero of the United States Geological Survey gage is 2,119.75 feet above sea level and the same datum has been used by the Washington Water Power Co. The St. Joe Boom Co.'s gage is at an arbitrary datum. Comparison of records for 1906–7 indicates that the zero of this gage is 2,118.80 feet above sea level. On December 28 and 29, 1909, a comparison of the Washington Water Power Co.'s gage and the St. Joe Boom Co.'s gage was 2,118.55 feet. Such comparisons are not as reliable as could be desired on account of wind effect on the lake and the gradual rising and falling of the lake surface. The Washington Water Power Co. has used 2,118.7 as the zero of the Boom Co.'s gage, and this elevation is probably as nearly correct as can be determined without running a very expensive level line over the mountains or installing self-registering gages.

All gage heights observed from the St. Joe Boom Co.'s gage from April 26, 1903, to February 14, 1905, had been reduced to the datum of the United States Geological Survey gage. Gage records have been furnished by the St. Joe Boom Co. and the Washington Water Power Co.

Daily gage height, in feet, of Cœur d'Alene Lake at Cœur d'Alene, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	23.05	23.9	22.65	31.1	32.55	27.4	26.1	24.0	22.25	21.3	21.45	25.25
2	22.9	24.0	23.1	30.75	32.25	27.2	26.05	23.9	22.2	21.3	21.4	25.1
3	22.9	24.05	24.1	30.6	31.90	27.0	26.0	23.85	22.15	21.3	21.4	25.0
4	22.75	24.05	25.3	30.55	31.5	26.9	26.0	23.8	22.1	21.5	21.35	24.9
5	22.7	24.0	26.5	30.4	31.2	26.7	26.0	23.75	22.1	21.65	21.3	24.9
6	22.6	23.95	27.3	30.25	30.9	26.65	26.0	23.7	22.1	21.75	21.3	24.9
7	22.55	23 95	27.85	30.1	30.65	26.55	25.9	23.65	22.05	21.8	21.3	24.9
8	22.5	23.9	28.1	30.15	30.4	26.55	25.85	23.65	22.0	21.85	21.3	24.8
9	22.45	23.8	28.2	30.3	30.3	26.5	25.8	23.6	22.0	21.9	21.55	24.75
10	22.4	23.7	28.2	30.7	30.25	26.4	25.7	23.55	22.0	21.9	21.8	24.65
11	22.4	23.6	28.15	31.1	30.25	26.4	25.7	23.5	21.95	21.9	22.2	24.6
12	22.3	23.5	28.1	31.55	30.45	26.4	25.6	23.45	21.9	21.9	22.7	24.5
13	22.2	23.5	28.1	31.95	30.6	26.3	25.55	23.4	21.85	21.9	23.3	24.35
14	22.2	23.45	28.3	32.2	30.65	26.3	25.5	23.3	21.85	21.9	23.6	24.25
15	22.1	23.35	28.45	32.35	30.6	26.3	25.4	23.25	21.8	21.85	23.8	24.1
16	22.0	23.25	28.75	32.2	30.5	26.3	25.3	23.2	21.8	21.9	23.95	23.95
17	22.0	23.15	29.05	32.1	30.3	26.3	25.25	23.1	21.8	21.9	24.0	23.85
18	22.0	23.1	29.45	31.9	30.05	26.3	25.1	23.05	21.75	21.85	24.1	23.7
19	21.95	23.0	29.7	31.7	29.75	26.3	25.05	23.0	21.75	21.8	24.1	23.6
20	21.9	22.9	30.15	31.7	29.5	26.3	25.0	23.0	21.7	21.8	24.1	23.45
21	21.85	22.8	30.8	31.8	29.25	26.3	24.9	23.0	21.7	21.8	24.2	23.3
22	21.85	22.7	31.6	32.1	29.0	26.3	24.85	22.9	21.7	21.8	24.6	23.2
23	21.85	22.6	32.2	32.3	28.8	26.3	24.8	22.9	21.65	21.7	25.3	23.2
24	22.0	22.55	32.9	32.3	28.55	26.25	24.7	22.8	21.6	21.7	25.6	23.1
25	22.5	22.5	33.25	32.3	28.4	26.25	24.6	22.7	21.55	21.7	25.8	23.1
26	22.9	22.45	33.25	32.4	28.3	26.2	24.55	22.6	21.55	21.6	25.8	23.1
27	23.2	22.45	33.0	32.6	28.2	26.2	24.45	22.6	21.5	21.6	25.7	23.05
28	23.45	22.5	32.7	32.8	28.0	26.2	24.35	22.5	21.45	21.55	25.6	23.0
29	23.55	.....	32.3	32.85	27.9	26.2	24.25	22.4	21.4	21.55	25.55	22.95
30	23.6	.....	31.9	32.75	27.7	26.15	24.2	22.3	21.35	21.5	25.45	22.9
31	23.7	.....	31.5	.....	27.5	.....	24.1	22.3	.....	21.45	.....	22.9

SPOKANE RIVER AT SPOKANE, WASH.

This station, which is located at the Martha Street Bridge in Spokane, Wash., was established October 17, 1896, but gage readings were not begun until October 25 of that year. From October 17, 1896, to July 8, 1903, the station was at the railway bridge of the Oregon Railroad & Navigation Co. From July 8, 1903, to March 30, 1904, it was located at the Olive Avenue Bridge. The gage at the Olive Avenue Bridge was set to read the same as the one at the railway bridge and, although the fall between the two points is 1.43 feet, the gages did read practically the same between stages 2.85 and 5 feet. On March 30, 1904, a gage was installed on the south side of the Mission Avenue Bridge and a cable was installed for making measurements at Martha Street, half a mile above the Mission Avenue Bridge. The gage at Mission Street was read from March 30, 1904, to March 1, 1907. On April 17, 1905, an auxiliary gage was installed a short distance upstream from the cable at Martha Street. During 1906–7 simultaneous readings were obtained on the Mission Avenue and Martha Street gages in order to determine the relation between the two.[1] Since March 1, 1907, the Martha Street gage has been used for daily observations.

[1] This table was published in Water-Supply Paper U. S. Geol. Survey No. 252, p. 119.

At present measurements are made from the cable at Martha Street.

The conditions at the station are favorable for good results.

The bed of the stream is composed of gravel and changes slightly during freshets, but the flow is controlled by a broad riffle above Mission Street. The banks are not subject to overflow. The discharge of the river at this point is greatly influenced by the operation of the power plant at Post Falls. During the summer water is stored in Cœur d'Alene Lake. A dam for this purpose was completed in July, 1906.

A record of gage heights of Spokane River has been kept by the Washington Water Power Co.[1] at its dam at Spokane, Wash., since March 22, 1891.

Estimates of discharge for 1891–1896 were published in the report for 1909.[2] The data for 1897 to 1909 have been published in the regular reports for those years. Some of these data are subject to revisions based on later measurements. These revisions have not yet been made.

Discharge measurements of Spokane River at Spokane, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 11	McGlashan and Ebert	255	3,700	26.25	19,800
Aug. 8	L. R. Allen	202	1,800	17.53	2,280
Aug. 13	do	204	1,800	17.61	2,220
Nov. 22	F. C. Ebert	215	2,240	20.06	5,620
Dec. 14	do	218	2,360	20.58	6,560

[1] For full description of this station see the Eighteenth Ann. Rept. U. S. Geol. Survey, pt. 4, 1896, pp. 359–360. Gage heights from 1891 to 1896, with full notes regarding changes in waste-gate openings and flashboards, as furnished by the company, were published in Water-Supply Paper U. S. Geol. Survey No. 11, pp. 85–88.

[2] Water-Supply Paper U. S. Geol. Survey No. 272, pp. 121–131.

Daily gage height, in feet, of Spokane River at Spokane, Wash., for 1910.

[A. C. Lingle, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	19.5	18.45	18.45	27.3	28.3	23.45	18.55	18.1	17.85	17.55	17.6	20.6
2	19.25	18.95	18.35	26.95	28.05	23.3	18.45	18.35	17.65	17.5	17.6	20.55
3	18.85	19.45	19.75	26.8	27.75	23.05	18.5	17.8	17.65	17.35	17.65	20.6
4	18.9	19.5	21.25	26.75	27.4	22.65	18.25	17.7	17.5	17.7	17.65	20.55
5	18.8	19.55	22.4	26.65	27.1	22.35	18.2	17.65	17.35	17.75	17.65	20.55
6	18.75	19.55	23.45	26.5	26.85	21.65	18.2	17.6	17.45	17.7	17.75	20.75
7	18.7	19.6	24.05	26.4	26.6	20.95	18.45	17.6	17.45	17.65	17.5	20.55
8	18.65	19.8	24.3	26.5	26.35	20.25	18.45	17.5	17.5	17.55	17.65	20.55
9	18.8	19.9	24.5	26.5	26.25	20.85	18.35	17.65	17.5	17.7	17.6	20.55
10	18.5	19.75	24.5	26.7	26.2	20.8	18.45	17.6	17.4	17.35	17.65	20.5
11	18.55	19.7	24.4	27.1	26.2	20.1	18.3	17.55	17.5	17.55	17.65	20.45
12	18.6	19.65	24.25	27.45	26.35	20.1	18.4	17.6	17.45	17.5	17.65	20.4
13	18.55	19.55	24.4	27.75	26.45	19.95	18.35	17.6	17.25	17.65	17.8	20.35
14	18.5	19.55	24.5	28.05	26.45	19.65	18.45	17.55	17.3	17.55	17.55	20.25
15	18.5	19.55	24.6	28.2	26.35	19.4	18.55	17.55	17.25	17.65	17.7	20.15
16	18.75	19.45	24.85	28.15	26.35	19.45	18.5	17.55	17.3	17.6	18.25	20.1
17	18.4	19.4	25.3	28.0	26.15	19.4	18.6	17.6	17.4	17.25	18.25	19.95
18	18.3	19.35	25.55	27.85	25.95	18.9	18.5	17.55	17.3	17.7	18.3	20.0
19	18.45	19.25	25.8	27.7	25.8	18.9	18.5	17.6	17.35	17.7	18.3	19.95
20	18.5	19.2	26.05	27.6	25.6	19.1	18.5	17.55	17.4	17.7	19.0	19.8
21	18.45	19.25	26.55	27.7	25.4	19.25	18.4	17.65	17.25	17.7	18.85	19.6
22	18.55	19.2	27.45	27.9	25.1	19.3	18.35	17.3	17.35	17.65	20.2	19.35
23	18.5	19.15	28.2	28.0	24.9	18.75	18.25	17.35	17.35	17.3	19.85	19.3
24	18.35	19.05	29.0	27.95	24.65	18.75	18.3	17.55	17.4	17.45	20.55	19.25
25	18.35	19.05	29.25	28.0	24.55	18.75	18.25	17.45	17.55	17.55	20.6	19.1
26	18.25	19.05	29.2	28.05	24.45	18.65	18.25	17.5	17.4	17.6	21.1	18.85
27	18.8	19.1	29.1	28.2	24.35	18.6	18.35	17.55	17.4	17.55	21.05	19.0
28	18.9	18.9	28.9	28.45	24.2	18.5	18.35	17.5	17.45	17.6	21.0	19.05
29	19.3	.....	28.45	28.5	23.9	18.5	18.4	17.95	17.45	17.6	20.85	19.1
30	19.25	.....	28.0	28.4	23.8	18.5	18.35	17.6	17.55	17.75	20.2	18.85
31	19.25	.....	27.65	.....	23.6	.....	18.45	17.6	.....	17.5	.....	18.85

NOTE.—Thin sheet of ice extending a few feet from bank Feb. 18 to 23.

Daily discharge, in second-feet, of Spokane River at Spokane, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,800	3,250	3,250	22,600	25,400	12,700	3,390	2,790	2,490	2,130	2,190	6,590
2	4,420	3,980	3,120	21,700	24,700	12,300	3,250	3,120	2,250	2,070	2,190	6,500
3	3,820	4,720	5,180	21,300	23,900	11,700	3,320	2,430	2,250	1,910	2,250	6,590
4	3,900	4,800	7,840	21,100	22,900	10,800	2,980	2,310	2,070	2,310	2,250	6,500
5	3,750	4,880	10,300	20,900	22,100	10,200	2,920	2,250	1,910	2,370	2,250	6,500
6	3,680	5,020	12,700	20,500	21,400	8,650	2,920	2,190	2,020	2,310	2,370	6,860
7	3,600	4,950	14,100	20,200	20,700	7,240	3,250	2,190	2,020	2,250	2,070	6,500
8	3,530	5,250	14,800	20,500	20,100	5,980	3,250	2,070	2,070	2,130	2,250	6,500
9	3,750	5,410	15,300	20,500	19,800	7,060	3,120	2,250	2,070	2,310	2,190	6,500
10	3,320	5,180	15,300	21,000	19,700	6,960	3,250	2,190	1,960	1,910	2,250	6,410
11	3,390	5,100	15,000	22,100	19,700	5,730	3,050	2,130	2,070	2,130	2,250	6,320
12	3,460	5,020	14,600	23,100	20,100	5,730	3,180	2,190	2,020	2,070	2,250	6,240
13	3,390	4,880	15,000	23,900	20,300	5,490	3,120	2,190	1,810	2,250	2,430	6,160
14	3,320	4,880	15,300	24,700	20,300	5,020	3,250	2,130	1,860	2,130	2,130	5,980
15	3,320	4,880	15,500	25,200	20,100	4,650	3,390	2,130	1,810	2,250	2,310	5,820
16	3,680	4,720	16,200	25,000	20,100	4,720	3,320	2,130	1,860	2,190	2,980	5,730
17	3,180	4,650	17,400	24,600	19,600	4,650	3,460	2,190	1,960	1,810	2,980	5,490
18	3,050	4,580	18,000	24,200	19,000	3,900	3,320	2,130	1,860	2,310	3,050	5,570
19	3,250	4,420	18,600	23,800	18,600	3,900	3,320	2,190	1,910	2,310	3,050	5,490
20	3,320	4,350	19,300	23,500	18,100	4,200	3,320	2,130	1,960	2,310	4,050	5,250
21	3,250	4,420	20,600	23,800	17,600	4,420	3,180	2,250	1,810	2,310	3,820	4,950
22	3,390	4,350	23,100	24,300	16,800	4,500	3,120	1,860	1,910	2,250	5,900	4,580
23	3,320	4,280	25,200	24,600	16,300	3,680	2,980	1,910	1,910	1,860	5,330	4,500
24	3,120	4,120	27,400	24,500	15,700	3,680	3,050	2,130	1,960	2,020	6,500	4,420
25	3,120	4,120	28,100	24,600	15,400	3,680	2,980	2,020	2,130	2,130	6,590	4,200
26	2,980	4,120	28,000	24,700	15,100	3,530	2,980	2,070	1,960	2,190	7,540	3,820
27	3,750	4,200	27,700	25,200	14,900	3,460	3,120	2,130	1,960	2,130	7,440	4,050
28	3,900	3,900	27,100	25,900	14,500	3,320	3,120	2,070	2,020	2,190	7,340	4,120
29	4,500	.....	25,900	26,000	13,800	3,320	3,180	2,610	2,020	2,190	7,060	4,200
30	4,420	.....	24,600	25,700	13,500	3,320	3,120	2,190	2,130	2,370	5,900	3,820
31	4,420	.....	23,600	.....	13,100	.....	3,250	2,190	.....	2,070	.....	3,820

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Low-water determinations liable to some error, due to daily fluctuation of stage below about 4,000 second-feet.

Monthly discharge of Spokane River at Spokane, Wash., for 1910.

[Drainage area, 4,000 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	4,800	3,050	3,620	0.905	1.04	223,000	B.
February	5,410	3,250	4,590	1.15	1.20	255,000	A.
March	28,100	3,120	17,700	4.42	5.10	1,090,000	A.
April	26,000	20,200	23,300	5.82	6.49	1,390,000	B.
May	25,400	13,100	18,800	4.70	5.42	1,160,000	A.
June	12,700	3,320	5,950	1.49	1.66	354,000	A.
July	3,460	2,920	3,180	.795	.92	196,000	B.
August	3,120	1,860	2,220	.555	.64	136,000	B.
September	2,490	1,810	2,000	.500	.56	119,000	B.
October	2,370	1,810	2,170	.542	.62	133,000	B.
November	7,540	2,070	3,770	.942	1.05	224,000	B.
December	6,860	3,820	5,480	1.37	1.58	337,000	A.
The year	28,100	1,810	7,750	1.94	26.48	5,590,000	

OKANOGAN RIVER BASIN.

GENERAL FEATURES.

Okanogan River rises in Okanogan Lake, in British Columbia, and flows southward, entering Columbia River near Brewster, Wash. Its course in Canada lies through a series of narrow lakes. The drainage area is comparatively rough and mountainous, and is timbered except along the river. The rainfall is approximately 20 inches a year.

The principal tributaries in the United States are Similkameen and Conconully rivers and Sinlahekin, Antoine, Bonaparte, Johnson, and Salmon creeks. The main stream is navigable from Brewster to Riverside, except during low-water periods, while the tributaries are used largely for irrigation.

SALMON CREEK NEAR OKANOGAN,[1] WASH.

This gaging station, which is located in sec. 31, T. 34 N., R. 26 E., on the stage road between Malott and Conconully, 14 miles from Malott, 11 miles from Conconully, and 6 miles above Okanogan, Wash., at the mouth of the stream, was established May 27, 1903.

The waters of this creek are used for storage in the development of the Okanogan project of the United States Reclamation Service, which has recently been completed. About 20,000 acres of land have been brought under irrigation and are at present open to settlement under the terms of the reclamation act.

The vertical staff gage is on the left bank, opposite the house of the observer. Discharge measurements are made from a footbridge.

The conditions at the station have not been favorable for accurate determination of discharge since 1909, as the bed of the creek is not

[1] Formerly described as "near Malott."

stable, and the tree to which the gage was attached died and allowed the gage to become displaced. This station was not visited during 1910.

The United States Reclamation Service installed a 20-foot Cippoletti weir at the Conconully dam and began observations July 6, 1910. The drainage area at the dam is 123 square miles; that at the station is 152 square miles. As there is probably little inflow from the intervening area except during the early spring when the snow is melting, the records at the two points should be nearly comparable. Comparison of the discharge computed from observations at the weir with gage heights at the current meter station indicates no material change in the rating curve since 1909. The daily discharge up to July 5 has therefore been determined from the 1909 curve; subsequent determinations have been made from the more reliable weir records and are presented herewith as tabulated by the United States Reclamation Service.

Daily gage height, in feet, of Salmon Creek near Okanogan, Wash., for 1910.

[Forrest Jones, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.6	0.75	0.75	0.5	0.8	1.5	1.35	1.35	1.1	0.4	0.4	0.45
2	.6	.75	1.35	.5	1.1	1.5	1.15	1.35	1.0	.4	.4	.45
3	.55	.7	1.55	.5	1.15	1.45	.75	1.35	.9	.5	.4	.45
4	.5	.65	1.3	.5	1.35	1.5	.6	1.35	.95	.35	.4	.45
5	.5	.65	1.15	.5	1.5	1.5	.6	1.35	.9	.4	.4	.45
6	.45	.65	.9	.5	1.55	1.45	1.35	1.4	.9	.35	.4	.45
7	.4	.65	.65	.5	1.55	1.5	1.4	1.45	.9	.35	.45	.45
8	.4	.65	.65	.5	1.5	1.5	1.4	1.4	.65	.35	.4	.45
9	.45	.65	.7	.5	1.5	1.5	1.4	1.35	.6	.35	.4	.45
10	.4	.65	.7	.55	1.15	1.5	1.45	1.4	.5	.35	.4	.45
11	.45	.65	.75	.6	.85	1.5	1.5	1.35	.5	.35	.4	.45
12	.45	.6	.75	.65	1.4	1.5	1.5	1.4	.5	.35	.45	.45
13	.5	.6	.85	.65	1.0	1.45	1.45	1.35	.5	.6	.4	.45
14	.5	.6	.85	.7	1.1	1.4	1.5	1.35	.5	.6	.45	.45
15	.5	.6	.85	.65	1.15	1.3	1.5	1.4	.5	.6	.45	.45
16	.5	.6	.9	.65	1.35	1.3	1.55	1.4	.5	.65	.45	.45
17	.5	.55	.9	.65	1.35	1.3	1.5	1.4	.5	.65	.45	.45
18	.5	.55	1.05	.65	1.35	1.35	1.45	1.4	.45	.65	.5	.45
19	.5	.55	1.15	.7	1.4	1.35	1.4	1.4	.45	.6	.5	.4
20	.5	.6	1.2	.7	1.45	1.4	1.45	1.4	.4	.6	.45	.4
21	.55	.6	1.2	.65	1.5	1.4	1.4	1.35	.45	.6	.4	.4
22	.6	.6	1.2	.65	1.5	1.4	1.4	1.2	.45	.6	.4	.4
23	.6	.6	1.2	.65	1.5	1.4	1.4	1.25	.5	.6	.4	.4
24	.6	.6	.85	.65	1.5	1.45	1.45	1.25	.5	.6	.4	.4
25	.6	.65	.65	.65	1.5	1.4	1.45	1.25	.5	.6	.4	.4
26	.65	.65	.65	.65	1.5	1.4	1.5	1.25	.5	.6	.4	.4
27	.9	.7	.65	.65	1.5	1.3	1.5	1.2	.5	.6	.4	.4
28	1.0	.7	.65	.7	1.45	1.3	1.5	1.25	.5	.5	.4	.4
29	.95	.....	.6	.65	1.4	1.35	1.4	1.25	.5	.4	.4	.4
30	.85	.....	.5	.65	1.45	1.4	1.45	1.3	.5	.4	.4	.4
31	.8	.....	.5	.....	1.5	.....	1.35	1.25	.....	.4	.....	.4

NOTE.—No ice was reported at this station. Began storing water in Conconully Reservoir Mar. 24, Date of release of water not given; probably about May 2. Water shut off at reservoir Sept. 1.

Gage heights liable to some error during the last half of the year and discharge values determined from them not considered so reliable as those obtained at the weir.

Daily discharge, in second-feet, of Salmon Creek near Okanogan, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	8	14	14	5	17	75	16	5	8	22	10	60	55
2	8	14	60	5	37	75	17	5	6	22	10	60	55
3	6	12	81	5	42	70	18	5	6	33	10	60	60
4	5	10	55	5	60	75	19	5	6	42	12	65	60
5	5	10	42	5	75	75	20	5	8	46	12	70	65
6	4	10	22	5	81	70	21	6	8	46	10	75	65
7	3	10	10	5	81	75	22	8	8	46	10	75	65
8	3	10	10	5	75	75	23	8	8	46	10	75	65
9	4	10	12	5	75	75	24	8	8	20	10	75	70
10	3	10	12	6	42	75	25	8	10	10	10	75	65
11	4	10	14	8	20	75	26	10	10	10	10	75	65
12	4	8	14	10	65	75	27	22	12	10	10	75	55
13	5	8	20	10	29	70	28	29	12	10	12	70	55
14	5	8	20	12	37	65	29	26	.....	8	10	65	60
15	5	8	20	10	42	55	30	20	.....	5	10	70	65
							31	17	.....	5	.....	75	.....

NOTE.—Daily discharge determined from a rating curve which is poorly defined.

Daily gage height, in feet, and discharge, in second-feet, of 20-foot Cippoletti weir at Conconully dam, near Okanogan, Wash., for 1910.

Mean gage heights.	Date. From—	Date. To—	Length of run.	Discharge. Second-feet.	Discharge. Total acre-feet.	Discharge. Acre-feet for month.
			Hours.			
0.88	July 6, 12 a. m.	July 7, 12 a. m.	24	55.6	111.2	.....
1.0	7, 12 a. m.	11, 12 a. m.	96	67.3	538.4	.....
1.07	11, 12 a. m.	14, 12 a. m.	72	74.5	447.3	.....
1.06	14, 12 a. m.	15, 12 a. m.	24	73.5	147.0	.....
1.10	15, 12 a. m.	16, 12 a. m.	24	77.7	155.4	.....
1.09	16, 12 a. m.	17, 12 a. m.	24	76.6	153.2	.....
1.10	17, 12 a. m.	18, 12 a. m.	24	77.7	155.4	.....
.91	18, 12 a. m.	20, 12 a. m.	48	58.5	234.0	.....
.93	20, 12 a. m.	21, 12 a. m.	24	60.4	120.8	.....
.92	21, 12 a. m.	23, 12 a. m.	48	59.4	237.6	.....
.93	23, 12 a. m.	24, 12 a. m.	24	60.4	120.8	.....
.95	24, 12 a. m.	26, 6 p. m.	66	62.3	342.65	.....
1.05	26, 6 p. m.	27, 8 a. m.	14	72.4	84.5	.....
1.04	27, 8 a. m.	28, 9 a. m.	25	71.4	148.75	.....
1.12	28, 9 a. m.	28, 7 p. m.	10	79.8	66.5	.....
1.11	28, 7 p. m.	29, 9 a. m.	14	78.7	91.8	.....
1.03	29, 9 a. m.	30, 11 a. m.	26	70.4	152.5	.....
1.02	30, 11 a. m.	31, 12 p. m.	37	69.4	213.9	.....
						3,521.70
1.06	Aug. 1, 12 a. m.	Aug. 2, 6 p. m.	42	73.5	257.25	.....
.91	2, 6 p. m.	4, 5 p. m.	47	58.5	229.2	.....
.89	4, 5 p. m.	4, 8 p. m.	3	56.5	14.12	.....
.86	4, 8 p. m.	5, 8 a. m.	12	53.7	53.7	.....
.83	5, 8 a. m.	6, 6 p. m.	34	50.9	144.04	.....
.86	6, 6 p. m.	7, 8 p. m.	26	53.7	116.35	.....
.89	7, 8 p. m.	8, 8 p. m.	24	56.5	113.0	.....
.91	8, 8 p. m.	10, 8 p. m.	48	58.5	234.0	.....
1.07	10, 8 p. m.	11, 7.30 p. m.	23.5	74.5	145.9	.....
1.08	11, 7.30 p. m.	13, 5 p. m.	45.5	75.6	278.65	.....
1.04	13, 5 p. m.	14, 8.30 p. m.	27.5	71.4	163.54	.....
1.00	14, 8.30 p. m.	15, 8 a. m.	11.5	67.3	64.5	.....
.97	15, 8 a. m.	16, 8 p. m.	36	64.3	192.90	.....
.94	16, 8 p. m.	18, 7 p. m.	47	61.4	240.5	.....
.83	18, 7 p. m.	19, 7.30 p. m.	24.5	50.9	106.7	.....

Daily gage height, in feet, and discharge, in second-feet, of 20-foot Cippoletti weir at Conconully dam, near Okanogan, Wash., for 1910—Continued.

Mean gage heights.	Date. From—	Date. To—	Length of run.	Discharge. Second-feet.	Discharge. Total acre-feet.	Discharge. Acre-feet for month.
			Hours.			
0.82	Aug. 19, 7.30 p. m.	23, 8 p. m.	96.5	50.0	402.1	.....
.87	23, 8 p. m.	26, 7 p. m.	71	54.6	323.1	.....
.97	26, 7 p. m.	30, 3.30 p. m.	92.5	64.3	533.1	.....
.77	30, 3.30 p. m.	31, 12 p. m.	32.5	45.5	122.14	.....
						3,734.79
.87	Sept. 1, 12 a. m.	Sept. 1, 8 a. m.	8	54.6	36.4	.....
.77	1, 8 a. m.	2, 8 a. m.	24	45.5	91.0	.....
.67	2, 8 a. m.	3, 8 a. m.	24	36.9	73.8	.....
.67	3, 8 a. m.	4, 8 a. m.	24	36.9	73.8	.....
.65	4, 8 a. m.	5, 8 a. m.	24	35.3	70.6	.....
.66	5, 8 a. m.	6, 8 a. m.	24	36.1	72.2	.....
.40	6, 8 a. m.	7, 8 a. m.	24	17.0	34.0	.....
.34	7, 8 a. m.	8, 8 a. m.	24	7.9	15.8	.....
.23	8, 8 a. m.	9, 8 a. m.	24	7.4	14.8	.....
.22	9, 8 a. m.	12, 8 a. m.	72	6.9	41.4	.....
.21	12, 8 a. m.	30, 12 p. m.	448	6.5	242.6	.....
						766.40
.11	Oct. 1, 12 a. m.	Oct. 3, 4 p. m.	64	2.5	13.4	.....
.00	3, 4 p. m.	11, 6 p. m.	194	.....	.....	.....
.20	11, 6 p. m.	21, 4.30 p. m.	238.5	6.0	119.3	.....
.08	21, 4.30 p. m.	31, 12 p. m.	247.5	1.5	30.9	.....
						163.60
.08	Nov. 1, 12 a. m.	Nov. 30, 12 p. m.	30 days	1.5	90.0	.....
						90.00
.08	Dec. 1, 12 a. m.	Dec. 31, 12 p. m.	31 days	1.5	93.0	.....
						93.00
Grand total, acre-feet, for 1910, from July						8,369.49

Monthly discharge of Salmon Creek near Okanogan, Wash., for 1910.

[Drainage area, 152 square miles.[a]]

Month.	Discharge in second-feet. Maximum.	Discharge in second-feet. Minimum.	Discharge in second-feet. Mean.	Discharge in second-feet. Per square mile.	Run-off. Depth in inches on drainage area.	Run-off. Total in acre-feet.
January	29	3	8.4	0.055	0.06	516
February	14	6	9.4	.062	.06	522
March	81	5	25.4	.167	.19	1,560
April	12	5	8.6	.057	.06	512
May	81	17	61.2	.402	.46	3,760
June	75	55	66.8	.439	.49	3,970
July	77.7	8	61.5	.500	.58	3,780
August	75.6	50.0	56.8	.462	.53	3,490
September	48.5	6.5	12.9	.105	.12	766
October	6.0	.0	2.67	.022	.03	164
November	1.5	1.5	1.5	.012	.01	90.0
December	1.5	1.5	1.5	.012	.01	93.0
The year	77.7	0	.....	.....	.....	1,920.0

[a] Run-off July to Dec. 31 measured just below Conconully dam (drainage area 123 square miles) and mean per square mile and depth in inches computed on that basis.

METHOW RIVER BASIN.

GENERAL FEATURES.

Methow River rises on the eastern slope of the Cascade Mountains, in the northern part of Okanogan County, flows southeastward and unites with Columbia River near Pateros. It is about 60 miles long, and its drainage basin, which lies west of the Okanogan Basin and east of the basin of Chelan Lake, comprises about 1,700 square miles. The most important tributaries of the Methow are Chewack Creek, which joins it near Winthrop, and Twisp River, which enters from the west at Twisp.

The country is rough and mountainous and lightly forested. The mean annual rainfall ranges from 70 to 80 inches on the summit of the Cascades to about 15 inches at the mouth of the river. Irrigation is not practiced except on the lands lying contiguous to the streams. A project is now under way whereby a large portion of the water will be used for the irrigation of bench lands in the vicinity of Brewster. The climatic conditions are favorable for intensive agriculture.

METHOW RIVER AT PATEROS, WASH.

The gaging station, which is located three-fourths mile above the old county bridge at Pateros, Wash., in sec. 35, T. 30 N., R. 23 E., was established May 3, 1903, at a point one-half mile farther downstream and was moved to the present site June 17, 1903.

No tributaries enter in the immediate vicinity of the station.

The gage is an inclined staff, fastened to two pine trees on the left bank, and is beyond the influence of backwater from Columbia River.

Discharge measurements are made from a cable installed June 4, 1904, at a point 500 feet above the gage. Previous measurements were made from the county bridge or from a temporary bridge, which replaced the county bridge when the latter was washed out in the summer of 1903.

The relation between gage height and discharge is at times affected by ice during the winter months.

The conditions of control at this point seem to be permanent, a good rating curve has been constructed, and the record may be considered excellent.

Discharge measurements of Methow River at Pateros, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 14 [a]	McGlashan and Ebert	304	3,180	9.50	9,670
Dec. 11 [b]	F. C. Ebert	159	363	4.26	530

[a] Measured at highway bridge. [b] Measured at cable.

Daily gage height, in feet, of Methow River at Pateros, Wash., for 1910.

[F. W. Robinson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.45	3.88	4.35	6.05	8.45	8.68	7.10	5.30	4.29	4.15	4.80	4.35
2	4.40	3.90	4.52	6.00	8.25	8.42	7.10	5.28	4.32	4.20	4.77	4.36
3	4.35	3.90	4.46	6.00	8.10	8.32	7.10	5.20	4.34	4.30	4.75	4.39
4	4.30	3.94	4.31	5.95	8.10	8.08	7.05	5.15	4.30	4.38	4.70	4.36
5	4.40	3.98	4.16	5.90	8.20	8.18	7.00	5.10	4.28	4.40	4.67	5.31
6	4.45	4.06	4.15	6.00	8.55	8.30	6.95	5.10	4.27	4.33	4.65	4.32
7	4.65	4.10	4.12	6.00	9.40	8.30	6.95	5.20	4.25	4.42	4.70	4.34
8	4.95	4.12	4.08	6.00	10.24	8.08	7.08	5.15	4.28	4.54	4.74	4.34
9	4.50	4.17	4.06	6.00	10.39	8.15	7.10	5.15	4.28	4.65	4.70	4.32
10	4.35	4.23	4.06	6.08	11.17	8.38	7.10	5.20	4.25	4.85	4.65	4.28
11	4.20	4.27	4.05	6.18	11.60	8.68	7.15	5.10	4.22	4.85	4.66	4.27
12	4.13	4.30	4.02	6.22	10.52	9.08	7.10	5.02	4.20	4.82	4.62	4.24
13	4.08	4.30	4.10	6.32	9.92	9.45	7.05	4.95	4.20	4.77	4.57	4.24
14	4.05	4.28	4.18	6.35	9.42	9.30	6.90	4.90	4.18	4.75	4.55	4.24
15	4.00	4.28	4.30	6.32	9.05	9.05	6.60	4.85	4.16	4.72	4.53	4.22
16	3.97	4.20	4.47	6.30	8.72	8.78	6.55	4.80	4.13	4.80	4.50	4.22
17	3.97	4.28	4.72	6.38	8.82	8.40	6.55	4.70	4.18	4.85	4.47	4.21
18	3.95	4.25	4.94	6.60	9.20	8.15	6.40	4.65	4.23	4.97	4.47	4.16
19	3.93	4.35	5.13	7.05	9.22	8.00	6.30	4.60	4.20	4.97	4.47	4.20
20	3.93	4.43	5.77	7.62	9.05	7.85	6.15	4.55	4.18	.....	4.50	4.18
21	3.95	4.43	6.32	7.78	8.90	7.70	6.05	4.55	4.18	4.87	4.58	4.16
22	3.95	4.22	6.48	7.78	10.00	7.55	6.08	4.50	4.20	4.80	4.60	4.13
23	3.96	4.38	6.62	7.85	10.25	7.35	5.98	4.47	4.22	4.74	4.65	4.14
24	4.08	4.45	6.60	8.40	10.53	7.15	5.90	4.43	4.22	4.70	4.50	4.14
25	4.02	4.45	6.55	9.40	10.70	6.95	5.85	4.40	4.18	4.80	4.42	4.08
26	3.95	4.43	6.42	10.50	10.02	7.25	5.75	4.37	4.18	5.12	4.20	4.02
27	3.85	4.37	6.38	10.40	9.40	7.30	5.65	4.36	4.17	5.07	4.31	4.07
28	3.77	4.35	6.28	9.55	8.78	7.25	5.60	4.35	4.16	4.98	4.39	4.08
29	3.73	.....	6.18	9.15	8.38	7.15	5.50	4.33	4.15	4.97	4.36	4.16
30	3.80	.....	6.12	8.72	8.28	7.05	5.40	4.30	4.15	4.93	4.36	4.16
31	3.86	.....	6.08	.....	8.30	.....	5.35	4.27	.....	4.92	.....	4.12

NOTE.—River frozen Jan. 1 to Mar. 3. Ice along banks Dec. 23 to 31.

Daily discharge, in second-feet, of Methow River at Pateros, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	525	291	480	2,340	7,220	7,440	4,270	1,300	535	470	480	565
2	502	296	558	2,250	6,760	7,150	4,270	1,280	550	490	819	570
3	480	296	529	2,250	6,410	6,290	4,270	1,190	560	540	805	585
4	459	309	545	2,170	6,410	6,370	4,160	1,140	540	580	770	570
5	502	322	474	2,090	6,640	6,590	4,060	1,090	530	590	750	545
6	525	347	470	2,250	7,440	6,870	3,960	1,090	525	555	738	550
7	627	360	458	2,250	9,430	6,870	3,960	1,190	515	601	770	560
8	814	366	442	2,250	11,400	6,370	4,230	1,140	530	669	798	560
9	548	382	434	2,250	11,800	6,520	4,270	1,140	530	738	770	550
10	480	404	434	2,390	13,700	7,050	4,270	1,190	515	878	744	530
11	416	420	430	2,560	14,800	7,740	4,380	1,090	500	878	744	525
12	393	432	418	2,620	12,100	8,660	4,270	1,020	490	855	718	510
13	376	432	450	2,790	10,700	9,550	4,160	958	490	819	687	510
14	366	424	482	2,840	9,480	9,190	3,860	915	482	805	675	510
15	348	424	540	2,790	8,600	8,600	3,280	878	474	784	663	500
16	338	392	628	2,760	7,840	7,970	3,190	840	462	840	645	500
17	338	424	784	2,900	8,070	7,100	3,190	770	482	878	628	495
18	332	412	949	3,280	8,950	6,520	2,930	738	505	974	628	474
19	325	452	1,120	4,160	9,000	6,190	2,760	705	490	974	628	490
20	325	485	1,900	5,360	8,600	5,860	2,500	675	482	932	645	482
21	332	485	2,790	5,710	8,250	5,530	2,340	675	482	892	693	474
22	332	400	3,070	5,710	10,900	5,220	2,390	645	490	840	705	462
23	335	464	3,320	5,860	11,500	4,800	2,220	628	500	798	738	466
24	376	494	3,280	7,100	12,100	4,380	2,090	606	500	770	645	466
25	355	494	3,190	9,430	12,600	3,960	2,020	590	482	840	601	442
26	332	485	2,960	12,100	10,900	4,580	1,870	575	482	1,110	490	418
27	302	460	2,900	11,800	9,430	4,690	1,730	570	478	1,060	545	438
28	281	452	2,730	9,790	7,970	4,580	1,660	565	474	983	585	442
29	271	.....	2,560	8,830	7,050	4,380	1,530	555	470	974	570	474
30	289	.....	2,450	7,840	6,820	4,160	1,410	540	470	940	570	474
31	304	.....	2,390	.....	6,870	.....	1,360	525	.....	932	.....	458

NOTE.—Daily discharge determined from a well-defined rating curve. Discharge for days in January reduced 15 per cent from the open-water rating, February reduced 20 per cent from the open-water rating, Mar. 1 to 3 reduced 15 per cent from the open-water rating, on account of ice. No reduction made Dec. 23 to 31.

Monthly discharge of Methow River at Pateros, Wash., for 1910.

[Drainage area, 1710 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	814	271	404	.236	0.27	24,800	C.
February	494	291	407	.238	.25	22,600	C.
March	3,320	418	1,420	.830	.96	87,300	B.
April	12,100	2,090	4,620	2.70	3.01	275,000	A.
May	14,800	6,410	9,350	5.47	6.31	575,000	A.
June	9,550	3,960	6,400	3.74	4.17	381,000	A.
July	4,380	1,360	3,120	1.82	2.10	192,000	A.
August	1,300	525	865	.506	.58	53,200	A.
September	560	462	500	.292	.33	29,800	A.
October	1,110	470	806	.471	.54	49,600	A.
November	840	490	687	.402	.45	40,900	A.
December	585	418	503	.294	.34	30,900	B.
The year	14,800	271	2,430	1.42	19.31	1,760,000	

CHELAN RIVER BASIN.

GENERAL FEATURES.

Chelan River forms the outlet of Lake Chelan, in Chelan County, Wash. The river, which joins Columbia River at Chelan Falls, Wash., is only 4 miles long and in this distance has a fall of 380 feet, which as yet has not been utilized for power development.

Chelan Lake is a narrow body of water, 48 miles long and about 1 mile wide, lying at an elevation of 1,080 feet above sea level. It is fed by mountain streams which have their sources in the glaciers of the Cascade Range. Owing to its great depth and to the mild temperature of the region, the lake is open to navigation for the whole year. The area contiguous to the lake is exceedingly rugged and mountainous and is lightly forested. The mean annual rainfall at Chelan is about 13 inches.

STEHEKIN RIVER AT STEHEKIN, WASH.

This station, which is located at the pipe line trestle of Hotel Fields, at Stehekin, Wash., three-eighths mile above the head of Lake Chelan, was established December 6, 1910.

The drainage area above this point is 360 square miles.

Low-water discharge measurements are made by wading. No equipment has yet been installed for high-water measurements.

The following discharge measurement was made by F. C. Ebert:

December 7: Width, 87 feet; area, 167 square feet; gage height, 1.00 foot; discharge, 665 second feet.

Daily gage height, in feet, of Stehekin River at Stehekin, Wash., for 1910.

[S. R. Wood, observer.]

Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.
1	.....	6	.....	11	1.1	16	0.9	21	0.6	26	0.5
2	.....	7	1.0	12	1.1	17	.9	22	.6	27	.5
3	.....	8	1.0	13	1.0	18	.7	23	.6	28	.5
4	.....	9	1.1	14	1.0	19	.7	24	.6	29	.5
5	.....	10	1.1	15	.9	20	.6	25	.6	30	.5
										31	.5

NOTE.—No ice reported at this station.

LAKE CHELAN AT CHELAN, WASH.

This station, which is located in sec. 13, T. 28 N., R. 22 E., at the Forest Service boat landing at Chelan, Wash., one-fourth mile above the highway bridge above the outlet of Lake Chelan on the road to Lakeside, Wash., was established December 5, 1910, in cooperation with the United States Forest Service.

The lake is usually free from ice at the gage, but it has been known to freeze over during short intervals in extremely cold weather.

Daily gage height, in feet, of Lake Chelan at Chelan, Wash., for 1910.

Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.
1	.....	6	.....	11	1.4	16	1.6	21	1.65	26	1.7
2	.....	7	.....	12	1.4	17	1.6	22	1.6	27	1.7
3	.....	8	.....	13	1.4	18	.....	23	1.7	28	1.8
4	.....	9	.....	14	1.4	19	.....	24	1.7	29	1.8
5	1.6	10	.....	15	1.5	20	1.6	25	1.7	30	1.8
										31	1.8

NOTE.—Flashboards put on dam Dec. 14.

CHELAN RIVER AT CHELAN, WASH.

This station, which is located at a highway bridge in sec. 13, T. 27 N., R. 22 E., 3,000 feet below the outlet of Chelan Lake, 4 miles northwest of Chelan Falls, in the town of Chelan, Wash., was established November 6, 1903.

Discharge measurements prior to 1906 were made from the new highway bridge half a mile above the gage and above a dam at the outlet of the lake. This dam partly controls the flow of the river. Since 1906 discharge measurements have been made at the lower bridge where the staff gage is located. The gage datum has remained unchanged. High-water measurements can best be made at the upper bridge.

Discharge measurements of Chelan River at Chelan, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 14[a]	McGlashan and Ebert	244	2,660	10.65	9,680
Dec. 4[b]	F. C. Ebert	272	724	6.15	1,430

[a] Measurement made at lower bridge, conditions not the best. A coefficient of 0.76 has been applied to part of velocities on account of angle which direction of current makes with bridge.
[b] Measurement taken at upper bridge, conditions good.

Daily gage height, in feet, of Chelan River at Chelan, Wash., for 1910.

[Clyde Farley, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.65	5.1	5.48	7.6	8.5	10.4	8.85	7.85	5.0	5.6	6.8	6.5
2	5.7	5.15	5.6	7.55	8.75	10.35	8.9	7.75	5.1	5.65	6.75	6.45
3	5.6	5.2	5.65	7.5	9.00	10.35	8.8	7.7	5.4	7.75	6.7	6.35
4	5.5	5.2	5.75	7.4	9.2	10.3	8.8	7.65	5.35	7.85	6.6	6.2
5	5.45	5.15	5.88	7.35	9.35	10.25	8.75	7.6	5.3	7.85	6.55	6.25
6	5.5	5.15	5.92	7.3	9.45	10.2	8.75	7.55	5.35	7.8	6.6	6.2
7	5.5	5.2	5.95	7.25	9.5	10.15	8.8	7.5	5.4	7.75	6.65	6.15
8	5.4	5.2	5.95	7.2	9.6	10.1	8.8	7.45	5.35	7.8	6.6	6.1
9	5.35	5.2	5.0	7.2	9.8	10.1	8.75	7.4	5.4	7.75	6.55	6.05
10	5.4	5.15	5.95	7.2	10.10	10.05	8.8	7.0	5.35	7.7	6.5	6.0
11	5.3	5.15	5.9	7.15	10.3	10.0	8.85	6.65	5.3	7.65	6.55	5.95
12	5.2	5.2	5.95	7.15	10.45	10.0	8.9	6.6	5.35	7.6	6.6	6.0
13	5.25	5.15	5.95	7.1	10.6	9.95	9.0	6.55	5.4	7.55	6.65	5.95
14	5.2	5.2	5.9	7.1	10.7	9.9	9.05	6.5	5.35	7.45	6.6	5.9
15	5.15	5.25	6.6	7.05	10.6	9.85	9.1	6.4	5.35	6.35	6.55	4.75
16	5.15	5.15	6.85	7.0	10.5	9.8	9.1	6.3	5.4	7.2	6.5	4.65
17	5.2	5.1	7.3	7.0	10.4	9.75	9.05	6.2	5.35	7.15	6.55	4.35
18	5.3	5.1	7.45	7.1	10.35	9.7	9.0	6.1	5.4	7.2	6.6	4.4
19	5.35	5.05	7.6	7.1	10.35	9.6	8.9	5.0	5.45	7.25	6.65	4.45
20	5.4	5.0	7.8	7.15	10.3	9.55	8.85	4.95	5.5	7.2	6.7	4.5
21	5.5	4.9	7.85	7.2	10.3	9.5	8.75	4.9	5.45	7.15	6.6	4.55
22	5.5	4.95	7.9	7.2	10.35	9.45	8.65	4.85	5.4	7.1	6.55	4.7
23	5.55	5.0	8.0	7.25	10.4	9.4	8.6	4.8	5.35	7.0	6.5	4.8
24	5.5	5.1	7.9	7.3	10.45	9.2	8.45	4.95	5.4	6.95	6.45	4.9
25	5.45	5.0	7.9	7.5	10.5	8.95	8.35	5.0	5.45	7.0	6.4	4.85
26	5.4	5.0	7.9	7.7	10.5	8.9	8.25	5.1	5.5	7.0	6.35	4.8
27	5.4	5.2	7.9	7.95	10.55	8.9	8.15	5.15	5.45	6.95	6.4	4.75
28	5.35	5.32	7.8	8.05	10.65	8.85	8.1	5.2	5.5	6.9	6.45	4.8
29	5.25	.....	7.8	8.15	10.55	8.85	8.05	5.15	5.55	6.95	6.5	4.7
30	5.2	.....	7.75	8.25	10.5	8.9	8.0	5.1	5.5	6.9	6.55	4.65
31	5.15	.....	7.7	.....	10.4	.....	7.95	5.05	.....	6.85	.....	4.6

NOTE.—No ice at this station.

Daily discharge, in second-feet, of Chelan River at Chelan, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	940	580	830	3,510	5,150	9,120	5,820	3,940	520	900	2,220	1,810
2	980	610	900	3,420	5,620	9,000	5,920	3,760	580	940	2,150	1,740
3	900	640	940	3,340	6,120	9,000	5,720	3,680	760	3,760	2,080	1,620
4	830	640	1,020	3,170	6,520	8,890	5,720	3,600	730	3,940	1,940	1,450
5	795	610	1,150	3,080	6,820	8,780	5,620	3,510	700	3,940	1,880	1,500
6	830	610	1,150	3,000	7,040	8,670	5,620	3,420	730	3,850	1,940	1,450
7	830	640	1,200	2,920	7,140	8,560	5,720	3,340	760	3,760	2,010	1,400
8	760	640	1,200	2,840	7,350	8,450	5,720	3,260	730	3,850	1,940	1,340
9	730	640	1,240	2,840	7,790	8,450	5,620	3,170	760	3,760	1,880	1,290
10	760	610	1,200	2,840	8,450	8,340	5,720	2,520	730	3,680	1,810	1,240
11	700	610	1,150	2,760	8,890	8,230	5,820	2,010	700	3,600	1,880	1,200
12	640	640	1,200	2,760	9,240	8,230	5,920	1,940	730	3,510	1,940	1,240
13	670	610	1,200	2,680	9,580	8,120	6,120	1,880	760	3,420	2,010	1,200
14	640	640	1,150	2,680	9,810	8,010	6,220	1,810	730	3,260	1,940	1,150
15	610	670	1,940	2,600	9,580	7,900	6,320	1,680	730	3,080	1,880	395
16	610	610	2,300	2,520	9,350	7,790	6,320	1,560	760	2,840	1,810	350
17	640	580	3,000	2,520	9,120	7,680	6,220	1,450	730	2,760	1,880	245
18	700	580	3,260	2,680	9,000	7,570	6,120	1,340	760	2,840	1,940	260
19	730	550	3,510	2,680	9,000	7,350	5,920	520	795	2,920	2,010	275
20	760	520	3,850	2,760	8,890	7,240	5,820	495	830	2,840	2,080	290
21	830	470	3,940	2,840	8,890	7,140	5,620	470	795	2,760	1,940	310
22	830	495	4,030	2,840	9,000	7,040	5,440	445	760	2,680	1,880	370
23	865	520	4,210	2,920	9,120	6,930	5,340	420	730	2,520	1,810	420
24	830	580	4,030	3,000	9,240	6,520	5,060	495	760	2,440	1,740	470
25	795	520	4,030	3,340	9,350	6,020	4,860	520	795	2,520	1,680	445
26	760	520	4,030	3,680	9,350	5,920	4,680	580	830	2,520	1,620	420
27	760	640	4,030	4,120	9,460	5,920	4,480	610	795	2,440	1,680	395
28	730	700	3,850	4,300	9,700	5,820	4,390	640	830	2,370	1,740	420
29	670	.....	3,850	4,480	9,460	5,820	4,300	610	865	2,440	1,810	370
30	640	.....	3,760	4,680	9,350	5,920	4,210	580	830	2,370	1,880	350
31	610	.....	3,680	.....	9,120	.....	4,120	550	.....	2,300	.....	330

NOTE.—Daily discharge determined from a rating curve well defined between 1,500 and 10,000 second-feet; fairly well defined between 700 and 1,500 second-feet, and poorly defined below 700 second feet.

Monthly discharge of Chelan River at Chelan, Wash., for 1910.

[Drainage area, 950 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	980	610	754	0.794	.92	46,400	C.
February	700	470	596	.627	.65	33,100	C.
March	4,210	830	2,480	2.61	3.01	152,000	B.
April	4,680	2,520	3,130	3.29	3.67	186,000	A.
May	9,810	5,150	8,470	8.92	10.28	521,000	A.
June	9,120	5,820	7,610	8.01	8.94	453,000	A.
July	6,320	4,120	5,500	5.79	6.68	338,000	A.
August	3,940	420	1,770	1.86	2.14	109,000	B.
September	865	520	750	.789	.88	44,600	C.
October	3,940	900	2,930	3.08	3.55	180,000	B.
November	2,220	1,620	1,900	2.00	2.23	113,000	A.
December	1,810	245	830	.874	1.01	51,000	C.
The year	9,810	245	3,080	3.24	43.96	2,230,000	

RAILROAD CREEK AT LUCERNE, WASH.

This station, which is located at a trail bridge at Lucerne, Wash., just above the mouth of the stream, was established December 6, 1910.

The entire flow of this stream could be diverted a few miles above the station into Dumpky Lake for storage. From Dumpky Lake to Lake Chelan there is a fall of over 1,100 feet in 1½ miles.

Low-water discharge measurements are made by wading in the vicinity of the gage. No equipment has yet been installed for high-water measurements.

The following discharge measurement was made by F. C. Ebert:

December 7: Width, 36 feet; area, 61 square feet; gage height, 0.70 foot; discharge, 109 second-feet.

Daily gage height, in feet, of Railroad Creek at Lucerne, Wash., for 1910.

[Mrs. Barbara Shearer, observer.]

Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.
1		6		11	0.6	16	0.75	21	0.45	26	0.5
2		7	0.7	12	.6	17	.5	22	.5	27	.4
3		8	.75	13	.55	18	.5	23	.6	28	.5
4		9	.7	14	.6	19	.5	24	.6	29	.4
5		10	.4	15	.55	20	.45	25	.6	30	.4
										31	.5

NOTE.—No ice reported at this station.

ENTIAT RIVER BASIN.

GENERAL FEATURES.

Entiat River rises in the Chelan Mountains just east of the main divide of the Cascades, between the headwaters of Railroad Creek, tributary to Lake Chelan, and White River, tributary to Lake Wenatchee, flows southeastward, and enters the Columbia at Entiat. Its drainage basin is relatively long and narrow and most of its tributaries are short, the principal one being Mad Creek, which enters from the west about 10 miles above Entiat.

Elevations within the basin range from about 700 feet above sea level at the mouth of the river to more than 9,000 feet in the mountains at the head. The precipitation ranges from about 12 inches in the valley along the lower river to perhaps 100 inches in the mountains. The upper part of the basin is heavily forested, but in the lowest parts forests are altogether lacking.

Irrigation is practiced to some extent along the narrow valley bottoms, but the quantity of water thus used is probably small.

The principal drawbacks to power development are the lack of good storage sites and the extremely low flow in winter, as in places the river may for a month at a time be blocked with ice several feet thick.

ENTIAT RIVER AT ENTIAT, WASH.

This gaging station, which is located in sec. 18, T. 25 N., R. 21 E., three-fourths mile above the town of Entiat, Wash., on the highway running up Entiat Valley, and one-eighth mile below the auxiliary power house of the Wenatchee Valley Gas & Electric Co., was established October 5, 1910, in cooperation with the Wenatchee Valley Gas & Electric Co.

Discharge measurements are made from a private bridge about 200 feet below the power house and about one-fourth mile above the gage. Gage heights fluctuate somewhat with changes of load when the power plant is in operation.

The following discharge measurement was made by F. C. Ebert:

December 2: Width, 54 feet; area, 104 square feet; gage height, 1.55 feet; discharge, 276 second-feet.

Daily gage height, in feet, of Entiat River at Entiat, Wash., for 1910.

[Wenatchee Valley Gas & Electric Co., observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec	Day.	Oct.	Nov.	Dec.
1		1.5	1.6	11		1.6	1.4	21		2.0	1.3
2		1.5	1.6	12		1.5	1.4	22		1.9	1.3
3		1.5	1.6	13		1.5	1.4	23		1.8	1.3
4		1.5	1.5	14		1.5	1.4	24		1.7	1.3
5	1.4	1.45	1.5	15		1.5	1.4	25		1.7	1.2
6	1.3	1.5	1.5	16		1.5	1.4	26		1.7	1.35
7	1.65	1.5	1.5	17		1.5	1.4	27		1.7	1.35
8	1.6	1.5	1.5	18		1.5	1.4	28		1.7	1.35
9	1.75	1.6	1.5	19		1.5	1.35	29		1.7	1.3
10		1.6	1.45	20		1.5	1.3	30		1.6	1.3
								31			1.3

NOTE.—No ice reported at this station.

WENATCHEE RIVER BASIN.

GENERAL FEATURES.

Wenatchee River rises in Cady Pass, at an elevation of 4,500 feet, flows southeastward, passing through Wenatchee Lake at an elevation of 1,870 feet, and empties into Columbia River at the town of Wenatchee, Wash. With its tributaries it drains a stretch of the eastern slope of the Cascade Mountains about 40 miles long and the territory north of the Yakima River drainage basin, from which it is separated by the Wenatchee Mountains.

The river has a number of tributaries, among which may be mentioned White River, which flows into Wenatchee Lake near its head, and Chiwawa, Nason, Chumstick, Icicle, Peshastin, and Mission creeks. The upper part of the drainage area is heavily forested, but the extreme lower part consists of timberless hills and ridges, in most places covered with sagebrush.

The mean annual precipitation at Wenatchee is 16 inches, a large part of it being in the form of snow. During portions of the winter the streams are icebound.

The data obtained are used in connection with the development of irrigation and water power. The Great Northern Railway has recently built a hydroelectric plant at Leavenworth, where about 7,000 horsepower is developed to operate trains through the Cascade Tunnel.

WENATCHEE RIVER NEAR LEAVENWORTH, WASH.

This station, which is located in sec. 12, T. 26 N., R. 17 E., 14 miles northwest from Leavenworth, Wash., on the Wenatchee Valley & Northern Railroad, and one-half mile below the mouth of Beaver Creek, was established November 28, 1910, in cooperation with the Quincy Valley Water Users' Association.

Discharge measurements are made from a cable three-eighths mile above the gage.

The following discharge measurement was made by F. C. Ebert:

November 28: Width, 288 feet; area, 733 square feet; gage height, 4.34 feet; discharge, 2,590 second-feet.

Daily gage height, in feet, of Wenatchee River near Leavenworth, Wash., for 1910.

[R. E. Nickles, observer.]

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1		3.96	11		3.38	21		3.10
2		3.89	12		3.34	22		3.09
3		3.80	13		3.30	23		3.12
4		3.75	14		3.24	24		3.21
5		3.68	15		3.15	25		3.18
6		3.65	16		3.09	26		
7		3.60	17		3.10	27	4.50	3.15
8		3.53	18		3.10	28	4.34	3.15
9		3.47	19			29	4.20	3.11
10		3.42	20		3.10	30	4.06	3.14
						31		3.12

NOTE.—No ice reported at this station.

WENATCHEE RIVER NEAR DRYDEN, WASH.

This station, which is located at the plant of the Valley Power Co., in sec. 26, T. 24 N., R. 18 E., at Sherman Spur, a station on the Great Northern Railway, near Dryden post office, about 4 miles above Cashmere, Wash., was established by the company April 27, 1909. It is about 500 feet below the Great Northern Railway bridge, and about 1 mile below the head gate of power canal.

The gage is a vertical staff fastened to the cribwork above the power house and is in the tailrace of one of the turbines in the power plant. No equipment for measuring discharge has been installed.

Gage heights have been furnished by the Valley Power Co.

Daily gage height, in feet, of Wenatchee River near Dryden, Wash., for 1910.

[Valley Power Co., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	1.35	0.9	2.7	4.45	5.4	3.4	1.9	0.6	0.75	1.55	2.4
2	1.3	1.3	1.6	2.75	4.2	5.1	3.45	1.8	.6	1.25	1.5	2.1
3	1.2	1.25	1.8	2.65	4.15	4.6	3.45	1.65	.6	1.9	1.5	2.05
4	1.0	1.2	2.05	2.5	4.1	4.35	3.4	1.7	.6	2.55	1.5	1.9
5	1.0	1.1	1.8	2.5	4.25	4.5	3.5	1.7	.6	2.5	1.45	1.9
6	0.9	1.1	1.8	2.75	4.8	4.5	3.45	1.7	.6	2.45	1.45	1.75
7	.9	1.2	1.6	2.75	5.75	4.5	3.75	1.7	.6	4.1	2.3	1.75
8	.9	1.2	1.55	2.75	6.3	4.3	3.85	1.6	.6	3.55	3.5	1.7
9	.9	1.2	1.5	2.7	6.7	4.1	4.05	1.7	.5	3.45	2.9	1.7
10	.9	1.1	1.55	2.7	7.15	4.25	4.0	1.8	.5	3.1	2.8	1.6
11	.9	1.0	1.85	2.75	7.35	5.0	4.1	1.7	.4	2.7	3.4	1.5
12	.9	1.0	1.9	3.0	6.75	5.35	4.25	1.65	.3	2.45	3.0	1.45
13	.8	1.0	2.2	3.0	6.45	4.75	4.05	1.5	.3	2.1	2.75	1.4
14	.8	1.0	2.5	3.0	5.7	4.4	3.7	1.4	.3	1.9	2.5	1.4
15	.8	1.0	2.65	2.85	5.15	4.25	3.3	1.4	.3	1.75	2.1	1.3
16	.8	1.0	2.95	2.95	4.8	4.9	3.3	1.3	.3	1.7	2.1	1.2
17	.75	1.0	3.2	3.05	4.9	4.0	3.3	1.1	.35	1.8	2.0	1.2
18	.75	0.8	3.45	3.25	5.45	3.8	2.95	1.1	.45	2.7	1.9	1.1
19	.9	.75	3.75	4.05	5.3	3.55	2.75	0.95	.5	2.4	1.8	1.05
20	.9	.75	4.7	4.75	4.95	3.75	2.7	1.0	.6	2.2	1.9	1.1
21	.8	.8	5.0	4.9	4.9	3.5	2.7	1.05	.6	1.95	5.6	1.1
22	.8	.7	4.65	4.75	5.2	3.25	2.7	1.05	.7	1.8	5.65	1.0
23	1.1	.7	4.4	4.85	5.9	3.0	2.6	1.0	.7	1.6	4.75	1.0
24	1.7	.7	4.1	5.45	6.5	3.0	2.2	0.9	.8	1.5	3.9	1.3
25	1.75	.7	3.7	6.45	6.9	3.25	2.2	.85	.6	2.65	3.4	1.25
26	1.55	.7	3.4	7.45	6.25	3.55	2.2	.8	.6	2.7	3.05	1.2
27	1.5	.7	3.25	7.00	5.55	3.6	2.1	.6	.5	2.35	2.8	1.2
28	1.4	.8	3.05	6.30	4.9	3.6	2.0	.65	.45	2.1	2.65	1.2
29	1.3	.....	2.9	5.55	4.65	3.4	2.0	.6	.4	1.95	2.5	1.1
30	1.3	.....	2.85	4.85	4.7	3.4	2.0	.6	.5	1.80	2.3	1.1
31	1.45	.....	2.7	.....	4.9	.....	1.9	.6	.....	1.55	.....	1.1

NOTE.—Gage heights are probably more or less affected by controlled flow.

WENATCHEE RIVER AT CASHMERE, WASH.

This station, which is located at a new highway bridge, called the upper bridge, in the SW.¼ sec. 32, T. 24 N., R. 19 E., on the main road from Cashmere to Leavenworth, was originally established July 26, 1904, at the highway bridge at Cashmere, Wash., one-half mile below the mouth of Mission Creek and 8 miles above the mouth of the river.

The bridge was rebuilt during the summer of 1907 and the staff gage removed, readings being taken from the temporary gages set by the observer. On September 28, 1908, the staff gage was replaced on the bridge at the same datum and the gage heights for the intervening period were reduced to this datum. These gage heights, however, are liable to considerable error. Gage readings were resumed June 20, 1909, and continued until October 12. On October 13, 1909, the station was moved to its present position 1 mile above the original site. The gage is a chain attached to the bridge.

Discharge measurements are made from the bridge.

Discharge measurements of Wenatchee River at Cashmere, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 6	H. D. McGlashan	236	986	3.18	4,300
May 12	McGlashan and Ebert	260	1,840	6.60	17,000
Nov. 26	F. C. Ebert	252	1,340	4.62	8,290
29	do	233	856	2.61	3,350

Daily gage height, in feet, of Wenatchee River at Cashmere, Wash., for 1910.

[Paul Kinney, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	1.5	1.6	3.2	5.55	5.6	3.7	2.2	1.0	0.65	1.9	2.45
2	1.5	1.45	2.1	3.2	5.55	5.5	3.85	2.15	.95	1.5	1.95	2.3
3	1.3	1.3	2.35	3.2	5.35	4.7	3.75	2.0	1.0	1.8	1.9	2.3
4	1.3	1.5	2.9	3.3	5.0	4.85	3.8	1.95	1.0	2.6	1.75	2.2
5	1.25	1.5	2.2	3.1	4.5	4.3	3.75	2.0	1.0	2.9	1.8	2.1
6	1.45	1.5	2.2	3.2	4.95	4.1	3.9	1.95	.95	2.9	1.8	1.6
7	1.4	1.55	2.1	3.25	5.0	4.75	3.85	1.95	.95	3.0	2.8	2.0
8	1.5	1.6	2.15	3.15	5.[illegible]	4.4	4.0	1.95	.95	3.4	3.7	1.95
9	1.45	1.55	2.1	2.25	6.7	4.5	4.1	2.05	.95	3.05	3.0	2.0
10	1.5	1.5	2.1	2.25	7.2	4.8	3.95	2.05	.9	2.95	3.0	1.8
11	1.45	1.5	2.2	2.3	7.15	5.5	3.8	2.05	.8	2.85	3.45	1.75
12	1.5	1.5	2.4	2.5	6.85	5.5	3.9	1.95	.6	2.6	3.25	1.75
13	1.4	1.5	2.4	2.35	6.2	5.2	3.95	1.95	.7	2.35	2.8	1.65
14	1.45	1.45	2.6	2.3	6.0	4.7	3.85	1.8	.6	2.25	2.65	1.6
15	1.5	1.35	2.9	2.6	5.7	4.6	3.5	1.75	.7	2.05	2.5	1.55
16	1.35	1.3	3.3	2.6	5.35	4.6	3.5	1.75	.6	1.9	2.3	1.5
17	1.4	1.5	3.3	3.5	5.25	4.25	3.6	1.5	.65	2.15	2.3	1.5
18	1.25	1.35	3.7	3.75	5.1	4.1	3.2	1.45	.75	2.8	2.25	1.5
19	1.25	1.3	3.8	4.5	5.25	4.0	2.85	1.35	.65	2.55	2.15	1.45
20	1.25	1.35	4.3	4.95	5.35	4.15	2.9	1.35	.9	2.3	2.15	1.45
21	1.3	1.45	5.2	5.5	5.25	3.8	3.0	1.45	.6	2.25	5.8	1.4
22	1.3	1.5	4.3	5.2	6.6	3.6	2.8	1.4	.9	2.05	5.4	1.4
23	1.5	1.45	4.4	5.1	6.0	3.55	2.75	1.35	.95	1.95	4.5	1.35
24	2.15	1.1	4.5	5.7	6.8	3.5	2.8	1.3	1.05	1.9	4.0	1.6
25	2.3	1.25	4.0	6.05	6.65	3.6	2.5	1.15	1.0	2.9	3.5	1.55
26	2.25	1.3	3.9	7.3	6.5	3.95	2.45	1.2	.95	2.9	3.15	1.5
27	2.1	1.3	3.9	6.85	5.5	3.8	2.4	1.05	.9	2.6	3.0	1.4
28	1.95	1.2	3.7	5.5	5.5	3.75	2.4	.95	.85	2.35	2.7	1.4
29	1.8	.....	3.6	5.55	5.6	3.7	2.35	1.0	.8	2.25	2.6	1.4
30	1.8	.....	3.6	5.05	5.6	3.7	2.3	.95	.75	1.95	2.5	1.45
31	1.8	.....	3.4	.....	5.55	.....	2.25	1.0	.....	1.75	.....	1.45

NOTE.—Slush ice reported running from Feb. 1 to 25.

Daily discharge, in second-feet, of Wenatchee River at Cashmere, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,870	1,480	1,600	4,410	12,000	12,200	5,580	2,490	980	750	2,020	2,940
2	1,480	1,420	2,330	4,410	12,000	11,800	5,970	2,410	940	1,480	2,100	2,660
3	1,260	1,260	2,750	4,410	11,100	8,600	5,710	2,170	980	1,870	2,020	2,660
4	1,260	1,480	3,800	4,620	9,680	9,140	5,840	2,100	980	3,220	1,800	2,490
5	1,210	1,480	2,490	4,200	7,920	7,280	5,710	2,170	980	3,800	1,870	2,330
6	1,420	1,480	2,490	4,410	9,500	6,680	6,100	2,100	940	3,800	1,870	1,600
7	1,370	1,540	2,330	4,520	9,680	8,780	5,970	2,100	940	4,000	3,600	2,170
8	1,480	1,600	2,410	4,300	10,900	7,600	6,380	2,100	940	4,840	5,580	2,100
9	1,420	1,540	2,330	2,580	17,500	7,920	6,680	2,250	940	4,100	4,000	2,170
10	1,480	1,480	2,330	2,580	20,000	8,960	6,240	2,250	900	3,900	4,000	1,870
11	1,420	1,480	2,490	2,660	19,800	11,800	5,840	2,250	830	3,700	4,960	1,800
12	1,480	1,480	2,840	3,030	18,200	11,800	6,100	2,100	725	3,220	4,520	1,800
13	1,370	1,480	2,840	2,750	15,000	10,500	6,240	2,100	775	2,750	3,600	1,660
14	1,420	1,420	3,220	2,660	14,100	8,600	5,970	1,870	725	2,580	3,320	1,600
15	1,480	1,320	3,800	3,220	12,700	8,260	5,080	1,800	775	2,250	3,030	1,540
16	1,320	1,260	4,620	3,220	11,100	8,260	5,080	1,800	725	2,020	2,660	1,480
17	1,370	1,480	4,620	5,080	10,700	7,130	5,320	1,480	750	2,410	2,660	1,480
18	1,210	1,320	5,580	5,710	10,100	6,680	4,410	1,420	802	3,600	2,580	1,480
19	1,210	1,260	5,840	7,920	10,700	6,380	3,700	1,320	750	3,120	2,410	1,420
20	1,210	1,320	7,280	9,500	11,100	6,830	3,800	1,320	900	2,660	2,410	1,420
21	1,260	1,420	10,500	11,800	10,700	5,840	4,000	1,420	725	2,580	13,200	1,370
22	1,260	1,480	7,280	10,500	17,000	5,320	3,600	1,370	900	2,250	11,300	1,370
23	1,480	1,420	7,600	10,100	14,100	5,200	3,500	1,320	940	2,100	7,920	1,320
24	2,250	1,070	7,920	12,700	18,000	5,080	3,600	1,260	1,020	2,020	6,380	1,600
25	2,660	1,210	6,380	14,300	17,200	5,320	3,030	1,120	980	3,800	5,080	1,540
26	2,580	1,260	6,100	20,500	16,500	6,240	2,940	1,160	940	3,800	4,300	1,480
27	2,330	1,260	6,100	18,200	11,800	5,840	2,840	1,020	900	3,220	4,000	1,370
28	2,100	1,160	5,580	11,800	11,800	5,710	2,840	940	865	2,750	3,410	1,370
29	1,870	.....	5,320	12,000	12,200	5,580	2,750	980	830	2,580	3,220	1,370
30	1,870	.....	5,320	9,870	12,200	5,580	2,660	940	802	2,100	3,030	1,420
31	1,870	.....	4,840	.....	12,000	.....	2,580	980	.....	1,800	.....	1,420

NOTE.—Daily discharge determined from a well-defined rating curve. No reduction made in daily discharge during February on account of slush ice.

Monthly discharge of Wenatchee River at Cashmere, Wash., for 1910.

[Drainage area, 1,200 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	2,660	1,210	1,590	1.32	1.52	97,800	A.
February	1,600	1,070	1,390	1.16	1.21	77,200	B.
March	10,500	1,600	4,550	3.79	4.37	280,000	A.
April	20,500	2,580	7,270	6.06	6.76	433,000	A.
May	20,000	7,920	13,100	10.9	12.57	806,000	A.
June	12,200	5,080	7,700	6.42	7.16	458,000	A.
July	6,680	2,580	4,710	3.92	4.52	290,000	A.
August	2,490	940	1,680	1.40	1.61	103,000	A.
September	1,020	725	873	.728	.81	51,900	A.
October	4,840	750	2,870	2.39	2.76	176,000	A.
November	13,200	1,800	4,100	3.42	3.82	244,000	A.
December	2,940	1,320	1,750	1.46	1.68	108,000	A.
The year	20,500	725	4,320	3.60	48.79	3,120,000	

CRAB CREEK BASIN.

GENERAL FEATURES.

The streams of the large area of the Columbia Plains embraced in the great sweep of the river, bounded on the north and west by the Columbia, on the south by Snake River, and on the east by the one hundred and eighteenth meridian, are insignificant. The only one that maintains a perennial flow along the greater portion of its channel is Crab Creek, which rises in the vicinity of Davenport, Wash., at an elevation of about 2,500 feet. The real channel of Crab Creek is along the Great Northern Railway as far as Adrian. It then turns abruptly southward, flows through the easterly tier of sections in Tps. 21 and 22 N., R. 27 E., to about sec. 12, T. 21, thence diagonally southeastward in a fairly straight course to the head of Parker Horn of Moses Lake. This portion of the stream may be designated upper Crab Creek. Along the greater part of this stretch, above Wilson Creek, the surface flow is perennial, though the channel is at times dry from an unknown distance above Odessa to a point about 3 miles below, where the stream emerges from the gravels in considerable volume. The water sinks again below Wilson Creek, except for a few weeks during the spring high water. About 15 miles below the lake the stream again takes a westerly direction, flowing in a broad-bottomed, steep-walled canyon. At some point near the middle of this lower course Crab Creek sinks finally, and it delivers no surface water to the Columbia at the mouth of its canyon, except at times of freshets. This section of the stream below Moses Lake may be designated lower Crab Creek.

Crab Creek has only a few branches that contribute to its surface flow throughout the year and a few more that flow during the rainy season, but it has a great number of deep tributary canyons, many of them scores of miles in length, which are dry except at periods of unusually heavy rainfall. These canyons, dry or containing only small streams disproportionate to their size, are known as coulées. They have all the topographic characters of stream-carved valleys, but evidently could not have been formed by stream erosion under present conditions. Their origin must be referred to a prehistoric period in which the region had an abundant rainfall and was well watered by surface streams. These branching systems of dry canyons represent ancient river systems.

The most important of the branches of the ancient Crab Creek system, except Grand Coulee, is Lind Coulee, in which the Northern Pacific Railway runs from Providence to Ritzville.

Providence Coulee, in which Hatton, Scott, and Connell are situated, is now devoid of flowing water, though it once formed the trunk of a river system almost as considerable as that for which Crab Creek is the master stream.

Of all the abandoned canyons of the Columbia Plains, however, the greatest and most remarkable is Grand Coulee. Not only does it possess many features of scenic grandeur, but its geologic history is of the highest interest. This great chasm was carved by Columbia River at a time when its profound gorge was dammed by a great ice lobe that came down the valley of the Okanogan and pushed southward some 30 miles across the plateau south of the master stream. The waters of the Columbia, deflected by the great glacier, flowed along its eastern face, and continuing southward in what is now the bed of Crab Creek regained their proper channel just above Sentinel Bluffs.

Lakes, most of them small and shallow and all situated in coulées, are numerous in the northern portion of the region. Their basins were formed by the erosion of former streams or dammed by wind-blown materials, and they are therefore usually elongated in form and separated by stretches of dry or meadowy land. The most important series of lakes in this region is that which lies in the bottom of the Grand Coulee and which includes Moses Lake, the largest sheet of water in the Columbia Plains.

Most of the lakes in this arid region have no outlets; others overflow only in the rainy season; as a consequence the small amounts of salts contained in all surface waters are concentrated in the lake basins by evaporation, and most of the lakes are more or less alkaline, Moses Lake containing about 0.32 gram of total solids per liter of water.[1]

The lakes in the lower section of the Grand Coulee are successively higher from south to north, and the northern lakes occasionally overflow to the south at seasons of high water. It follows that while the water of the northernmost of these lakes is comparatively fresh and palatable, the waters of the others become successively more alkaline to the south. Soap Lake, the most southerly, being extremely alkaline.

The annual rainfall in this area is from 10 to 20 inches, most of which falls during the winter months. On the higher lands, which receive more rainfall than the valley lands, great quantities of wheat are grown; on the lower lands successful agriculture is not possible without irrigation. Some development by pumping from Moses Lake and from wells has proved fairly successful. About 1,000 acres of land between Adrian and Ephrata are irrigated by a gravity system that takes water from upper Crab Creek.

UPPER CRAB CREEK AT ADRIAN, WASH.

This station, which is located just above Adrian, on the line of the Great Northern Railway and just above the point where the Connell & Northern branch of the Northern Pacific crosses Crab

[1] Ann. Rept. Geol. Survey Washington, vol. 1, 1901, p. 294.

Creek, was established December 9, 1909, but no records were obtained until 1910, as the water runs at this station only when the snow is melting during the winter and spring.

Observations at this point do not determine the amount of water entering Moses Lake, as the stream divides a short distance below Adrian, part of the water following a southward course into the head of Parker Horn of Moses Lake and part following westward along the line of the Great Northern Railway into a large depression. In the earlier part of a flood most of the water takes the latter course and it continues to flow in this direction until the depression is filled, forming a lake sometimes 2 to 3 miles long. When this has happened most of the water turns and goes down the other channel.

The creek channel is here considerably higher than the bed of Rockyford Creek, which lies to the west, and it is not unlikely that a considerable part of the water seeps into the porous lava and finds its way underground to the springs which form the head of Rockyford Creek.

Two gages were installed 500 feet apart, set at the same datum, and read simultaneously, the intention being to determine the slope and cross section of the stream and estimate the discharge by means of Kutter's formula. Discrepancies in the determination of slope have prevented fulfillment of this intention, but a fairly good rating curve for the upper gage has been obtained by means of the discharge measurements made by wading. The results are only approximate, as the stream is flashy, the channel over which it flows is wide and rough, and measurements covering extreme high stages are lacking.

The following discharge measurement was made by H. D. McGlashan:

April 5: Width, 80 feet; area, 107 square feet; gage height, upper gage, 0.63 feet; gage height, lower gage, 0.01 feet; discharge, 83 second-feet.

Daily gage height, in feet, of upper Crab Creek at Adrian, Wash., for 1910.

[Upper gage.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	.....	1.1	0.75	0.7	0.2	16	.....	.....	0.9	0.4	.....
2	.....	.6	1.55	.6	.2	17	.....	.....	.8	.3	.....
3	.....	.35	3.1	.6	.2	18	.....	.....	.8	.3	.....
4	.....	.6	3.2	.6	.2	19	.....	.....	.8	.3	.....
5	.....	.65	3.0	.6	.2	20	.....	.....	.8	.3	.....
6	.....	.25	2.55	.6	.2	21	.....	.....	.8	.3	.....
7	.....	.....	2.0	.6	.2	22	.....	.....	.7	.3	.....
8	.....	.....	1.8	.6	.....	23	.....	.....	.7	.3	.....
9	.....	.....	1.55	.5	.....	24	.....	.....	.8	.3	.....
10	.....	.....	1.4	.5	.....	25	.....	.....	.8	.3	.....
11	.....	.....	1.25	.5	.....	26	.....	.....	.8	.3	.....
12	.....	.....	1.2	.5	.....	27	3.6	.....	.....	.3	.....
13	.....	.....	1.1	.4	.....	28	2.75	.....	.....	.2	.....
14	.....	.....	1.05	.4	.....	29	2.1	.....	.....	.2	.....
15	.....	.....	.95	.4	.....	30	1.55	.....	.....	.2	.....
						31	1.35	.....	.....	.....	.....

NOTE.—Creek dry Jan. 1 to 26, Feb. 7 to 28, and after about May 7. No readings made Mar. 27 to 31. Discharge probably fairly steady during this period.

Daily discharge, in second-feet, of upper Crab Creek at Adrian, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	.....	190	105	95	22	16	.....	.....	138	46	.....
2	.....	77	358	77	22	17	.....	.....	115	33	.....
3	.....	40	1,470	77	22	18	.....	.....	115	33	.....
4	.....	77	1,570	77	22	19	.....	.....	115	33	.....
5	.....	86	1,370	77	22	20	.....	.....	115	33	.....
6	.....	28	980	77	22	21	.....	.....	115	33	.....
7	.....	.....	590	77	22	22	.....	.....	95	33	.....
8	.....	.....	480	77	.....	23	.....	.....	95	33	.....
9	.....	.....	358	61	.....	24	.....	.....	115	33	.....
10	.....	.....	295	61	.....	25	.....	.....	115	33	.....
11	.....	.....	238	61	.....	26	.....	.....	115	33	.....
12	.....	.....	220	61	.....	27	1,970	.....	105	33	.....
13	.....	.....	190	46	.....	28	1,140	.....	105	22	.....
14	.....	.....	176	46	.....	29	650	.....	105	22	.....
15	.....	.....	150	46	.....	30	358	.....	105	22	.....
						31	275	.....	105	.....	.....

NOTE.—Discharge determined from a rating curve is fairly well defined below 300 second-feet, and approximate above that point.
Discharge Mar. 27 to 31 interpolated.
There may have been small discharge subsequent to May 7, but it probably was negligible.

Monthly discharge of upper Crab Creek at Adrian, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	1,970	0	142	8,730	D.
February	190	0	17.8	989	B.
March	1,570	95	333	20,500	C.
April	95	22	49.7	2,960	C.
May	22	0	5.0	307	D.
The period	.....	.....	.....	33,500	

MOSES LAKE AT MOSES LAKE, WASH.

A lake gage was established in the Parker Horn of Moses Lake, June 23, 1909, at a point 1 mile west of Moses Lake post office, on the east shore of Moses Lake, near the center of sec. 28, T. 19 N., R. 28 E. The gage was established in connection with the evaporation station at this point.

The water of Moses Lake may be used to irrigate lands on the south side of Frenchman Hill, or may be diverted by pumping onto lands lying along the lake.

The evaporation pan is of galvanized iron, 3 feet square and 2 feet deep, inclosed by a boom of logs. In the center of the pan is a needle point to which the water is adjusted at the time of observations. The observer is supplied with a cup which holds sufficient water to increase the depth in the pan one-tenth of an inch. In this manner the number of cupfuls added at each observation is readily reduced to inches of evaporation. There is also a rain gage at Moses Lake post office.

As the evaporation pan was not well located, and during 1910 was not properly attended to, the records are not considered worthy of publication.

The lake gage was taken out by ice during the winter of 1909–1910, and the new gage installed April 3, 1910, bears no determined relation to the former gage.

Daily gage height, in feet, of Moses Lake at Moses Lake, Wash., for 1910.

[Frank Crast, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1							1.70		
2		1.71		1.53	1.44				
3	2.2					1.64			2.4
4	2.15				1.43				
5		1.69		1.51				1.84	
6	2.2			1.51	1.43				
7		1.68							
8							1.60		
9	2.1			1.50	1.43				
10						1.66			2.47
11		1.70							
12			1.57	1.51				1.9	
13					1.44				
14		1.64		1.50					
15							1.61		
16	2.0	1.63		1.50					
17	1.95				1.41	1.68			2.52
18	1.9	1.61							
19				1.50				2.05	
20									
21		1.60		1.50					
22							1.62		
23	1.8	1.62		1.50	1.40				2.70
24				1.48					
25	1.8								
26			1.57	1.46				2.25	
27	1.75				1.38	1.68			
28				1.45					
29	1.72						1.73		
30	1.71		1.57	1.45					
31					1.62				2.90

ROCKYFORD CREEK NEAR EPHRATA, WASH.

This station, which is located at Drumheller's ranch, 8 miles southeast of Ephrata, in the SE. ¼ sec. 5, T. 20 N., R. 27 E., is maintained in cooperation with Ham, Yearsley & Ryrie, of Spokane.

The gage is a vertical staff on the right bank of the stream at a private bridge 500 feet south of Drumheller's house.

Discharge measurements are made from the bridge.

The bed of the stream is of hard clay and not liable to change.

During 1910 a temporary dam was constructed at a bridge a short distance below the gage for the purpose of raising the water to a height conveniently reached by cattle. Gage heights during a large part of 1910 were affected to an unknown extent by backwater from this dam and no reliable estimates of discharge can be made.

Discharge measurements of Rockyford Creek near Ephrata, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 4	H. D. McGlashan	18	73	4.65	79
Dec. 13	F. C. Ebert	20	105	5.02[a]	57

[a] Water backed up by dam about one-half mile below gage.

Daily gage height, in feet, and discharge, in second-feet, of Rockyford Creek near Ephrata, Wash., for 1910.

[I. R. Stevens, observer.]

Day.	January.		February.		March.		April.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	4.4	67	4.65	77	4.85	86	4.6	75
2	4.4	67	4.6	75	4.85	86	4.6	75
3	4.4	67	4.6	75	4.85	86	4.6	75
4	4.45	69	4.65	77	4.9	88	4.6	75
5	4.4	67	4.6	75	4.9	88	4.65	77
6	4.45	69	4.65	77	4.6	75	4.6	75
7	4.45	69	4.65	77	4.6	75	4.65	77
8	4.45	69	4.65	77	4.5	71	4.6	75
9	4.45	69	4.5	71	4.5	71	4.6	75
10	4.4	67	4.5	71	4.45	69	4.65	77
11	4.4	67	4.5	71	4.45	69	.....	.....
12	4.45	69	4.5	71	4.45	69	.....	.....
13	4.4	67	4.45	69	4.5	71	.....	.....
14	4.45	69	4.45	69	4.5	71	.....	.....
15	4.45	69	4.45	69	4.45	69	.....	.....
16	4.45	69	4.45	69	4.45	69	.....	.....
17	4.45	69	4.45	69	4.45	69	.....	.....
18	4.6	75	4.45	69	4.45	69	.....	.....
19	4.65	77	4.45	69	4.45	69	.....	.....
20	4.65	77	4.65	77	4.45	69	.....	.....
21	4.65	77	4.65	77	4.45	69	.....	.....
22	4.65	77	4.65	77	4.85	86	.....	.....
23	4.6	75	4.7	79	4.85	86	.....	.....
24	4.6	75	4.7	79	4.8	83	.....	.....
25	4.65	77	4.7	79	4.8	83	.....	.....
26	4.65	77	4.7	79	4.8	83	.....	.....
27	4.65	77	4.8	83	4.6	75	.....	.....
28	4.65	77	4.8	83	4.6	75	.....	.....
29	4.65	77	.....	.....	4.65	77	.....	.....
30	4.6	75	.....	.....	4.65	77	.....	.....
31	4.65	77	.....	.....	4.65	77	.....	.....

NOTE.—Channel kept open by springs above the gage. A dam was constructed about one-half mile below the gage and all gage readings made subsequent to Apr. 10 are considered worthless.

Daily discharge determined from a fairly well defined rating curve.

Monthly discharge of Rockyford Creek near Ephrata, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	77	67	71.9	4,420	B.
February	83	69	74.6	4,140	B.
March	88	69	76.1	4,680	B.
Apr. 1-10	77	75	75.6	1,500	B.
The period	.....	.....	.....	14,700	

LOWER CRAB CREEK NEAR WARDEN, WASH.

This station, which is located on the McManamon ranch, 12 miles west of Warden, in the SW. ½ sec. 24, T. 17 N., R. 28 E., and below the mouth of Lind Coulee, was established June 23, 1909.

The gage is a vertical staff driven in the bed of the stream on the left bank. Measurements are made by wading. The banks of the stream are low and subject to overflow. The bed is composed of shifting sand. During the summer months the water is supplied by seepage from Moses Lake and from several springs in the vicinity. The largest spring, that on the lower Drumheller ranch, probably discharges 15 to 20 second-feet.

Discharge measurements of lower Crab Creek near Warden, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 2[a]	H. D. McGlashan	81	50	4.15	186
May 16	McGlashan and Ebert	40	25.2	4.20	79.3
Nov. 11[a]	F. B. Storey	31	10.2	3.89	24.9
11[a]	do	12.7	8.83	3.89	24.1

[a] Made by wading.

Daily gage height, in feet, of lower Crab Creek near Warden, Wash., for 1910.

[Chas. M. Thurman, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	2.8	4.4	4.1	4.0	4.1						
2	1.8	3.2	3.9	4.1	4.0	4.1				4.0		
3	2.0	3.8	3.6	4.1	4.0	4.1						
4	2.4	4.0	3.7	4.0	4.1	4.0			4.0			3.9
5	2.0	4.8	3.6	4.0	4.0	4.0						
6	2.2	4.6	3.6	4.1	4.1	4.0					3.8	
7	2.0	4.2	3.7	4.1	4.0	4.0		3.9				
8	1.9	4.0	3.9	4.1	4.1	4.1						
9	1.8	3.9	4.0	4.1	4.0	4.1				4.0		
10	2.0	3.9	4.1	4.1	4.1	4.1						
11	2.5	3.8	4.2	4.1	4.0	4.0			3.9		3.9	3.9
12	2.0	3.8	4.2	4.1	4.0	4.0						
13	2.8	3.9	4.1	4.1	4.0	4.0					3.9	
14	3.2	3.8	4.1	4.0	4.1	4.1		3.9				
15	3.4	3.8	4.1	4.0	4.1	3.9						
16	3.5	3.7	4.1	4.0	4.0	4.1				4.0		
17	2.0	3.7	4.1	4.0	4.1	4.1						
18	1.8	3.8	4.1	4.0	4.0	4.1			3.9			3.9
19	2.1	3.7	4.2	4.0	4.0	4.0	3.9					
20	1.7	3.8	4.2	4.1	4.0	4.0					3.9	
21	2.0	3.7	4.1	4.0	4.0	4.0		3.9				
22	1.8	3.7	4.1	4.0	4.0	4.0						
23	4.2	3.7	4.0	4.1	4.1	4.0			3.9	3.9		
24	5.4	3.7	4.0	4.0	4.1	4.0						
25	3.0	3.7	4.0	4.0	4.1	4.0	4.0		4.0			3.9
26		3.8	4.0	4.0	4.1	4.0						
27		3.75	4.0	3.9	4.1	4.0					3.9	
28		5.4	4.0	4.0	4.2	4.0		3.9				
29			4.0	3.9	4.1	4.0						
30			4.0	4.0	4.1	4.0				3.9		
31			4.1		4.1		3.9					

NOTE.—Three gages were used during the year: The first was washed out Jan. 23; the datum of the third, which was installed Mar. 1, is the same as that of the first; the datum of the second gage, which was used during February, is not definitely known but was probably not greatly different. Gage heights were more or less affected by ice at intervals from Jan. 1 to Feb. 21.

Gage heights Jan 23 to 25 estimated from hydrograph; crest height about 6 feet Jan. 24.

Crest height of flood Feb. 28, about 7 feet; mean gage height for the day determined from hydrograph.

Daily discharge, in second-feet, of lower Crab Creek near Warden, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	25	60	308	185	86	66	52	36	38	38	25	24
2	35	113	220	179	86	66	52	36	39	38	24	24
3	45	210	160	179	86	66	52	36	40	38	23	24
4	55	244	176	162	90	55	51	36	41	38	22	24
5	64	390	160	148	77	55	50	36	40	38	21	24
6	74	350	160	164	90	52	50	36	38	38	20	24
7	84	280	176	164	77	52	49	36	37	38	21	24
8	72	244	188	164	81	62	48	36	36	38	22	24
9	60	227	215	154	68	62	48	36	35	38	23	24
10	84	227	232	154	81	62	47	36	34	38	24	24
11	157	210	250	154	68	52	46	36	33	37	25	24
12	84	210	250	154	57	52	45	36	33	37	24	24
13	210	227	220	142	57	52	44	36	33	36	24	24
14	290	210	220	127	70	62	44	36	33	36	24	24
15	200	210	220	127	67	42	43	36	33	35	24	24
16	150	193	220	127	56	62	42	36	33	35	24	24
17	100	193	220	116	66	62	41	36	33	34	24	24
18	60	210	208	116	55	62	40	36	33	32	24	24
19	98	193	226	116	55	52	39	36	32	31	24	24
20	50	210	226	130	55	52	40	36	32	30	24	24
21	84	193	208	106	55	52	41	36	31	29	24	24
22	60	193	208	106	55	52	42	36	30	28	24	24
23	550	193	180	120	66	52	44	36	30	27	24	24
24	900	193	180	106	66	52	46	35	34	27	24	24
25	240	193	180	96	66	52	48	35	38	27	24	24
26	60	210	180	96	66	52	46	34	38	27	24	24
27	60	200	180	83	66	52	44	34	38	27	24	24
28	60	600	180	96	78	52	42	33	38	27	24	24
29	60	.....	168	83	66	52	40	34	38	27	24	24
30	60	.....	168	86	66	52	38	36	38	27	24	24
31	60	.....	185	.....	66	.....	36	37	.....	26	.....	24

NOTE.—Discharge interpolated, on account of ice, Jan. 2 to 6 and 15 to 17; relation of gage height to discharge assumed unaffected by ice during the remainder of January and February.

Two approximate rating curves were used, one applied from Jan. 1 to 25 and the other from Feb. 1 to 28. Discharge Jan. 26 to 31 estimated. Discharge for the remainder of the year computed by shifting-channel method.

Monthly discharge of lower Crab Creek near Warden, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	900	25	135	8,300
February	600	60	228	12,700
March	308	160	202	12,400
April	185	83	131	7,800
May	90	55	69.2	4,250
June	66	42	55.6	3,310
July	52	36	44.8	2,750
August	37	33	35.7	2,200
September	41	30	35.3	2,100
October	38	26	33.0	2,030
November	25	20	23.5	1,400
December	24	24	24.0	1,480
The year	900	20	83.9	60,700

NOTE.—Monthly discharge only roughly approximate.

YAKIMA RIVER BASIN.

GENERAL FEATURES.

Yakima River rises in Keechelus Lake, in the northwestern part of Kittitas County, and flows southeastward for about 150 miles to its junction with the Columbia, 8 miles northwest of Pasco and 4 miles above the mouth of Snake River. Its drainage area, comprising 5,270 square miles, extends southward from the Wenatchee Mountains and includes a stretch of nearly 100 miles along the eastern slope of the Cascade Range. It has many tributaries, the most important coming from the west, as is shown by the following table:

Principal tributaries of Yakima River.

From the south and west:	From the north and east:
Big Creek.	Kachess River (Kachess Lake).
Taneum Creek.	Clealum River (Clealum Lake).
Manastash Creek.	Teanaway Creek.
Wenas Creek.	Swauk Creek.
Naches River (draining about 50 miles of Cascade Range).	Wilson Creek.
Tieton River.	Cherry Creek.
Cowiche Creek.	Selah Creek.
Atanum Creek (forming northern boundary of Yakima Indian Reservation.	
Toppenish Creek (draining Yakima Indian Reservation).	
Satus Creek.	

The country at the headwaters of these streams is densely forested and mountainous. The general elevation of the summit of that portion of the Cascade Mountains drained by them is 5,500 feet above sea level. Keechelus Lake is 2,458 feet above sea level, Kachess Lake 2,230, Clealum Lake 2,130, Ellensburg 1,545, North Yakima 1,090, and Kiona 515 feet.

The agricultural lands of this basin lie in four distinct valleys. The upper, beginning just below the mouth of Swauk Creek and known as the Kittitas Valley, is somewhat oval in shape, about 30 miles long and 16 miles wide. Ellensburg is its chief city. Below Kittitas Valley the river flows in a narrow canyon, from which it emerges into Selah Valley. From Selah Valley it passes through a narrow gap into Yakima and Moxee valleys. Below Moxee Valley the river has cut its way through the Atanum and Rattlesnake ridges, forming a short narrow canyon, known as Union Gap. Below Union Gap the river flows to its mouth through a wide valley, unbroken except for the Toppenish Ridge, which lies south of the river, approximately at right angles to its course.

The mean annual rainfall at Clealum is 28 inches, at Ellensburg 10 inches, at North Yakima 9 inches, and at Sunnyside 7 inches.

The greater part of the precipitation occurs in the winter as snow. The snowfall near the summit of the Cascade Range frequently aggregates 25 or 30 feet in one season.

Irrigation has been practiced in this valley for many years, and ditches of all sizes—from the small ditch watering a few acres on the banks of the creeks to large canals that extend for 60 miles and cover 40,000 or 50,000 acres of land—have been in successful operation for a number of years. The products cover the entire range of irrigated agriculture, from hay and grain in the upper portion of the valley to the fancy fruits raised throughout the lower portions of the basin. Irrigated orchards in the vicinity of North Yakima have attained a value of $1,000 to $3,000 an acre.

The United States Reclamation Service has undertaken the general development of this valley. The principal storage reservoirs are Keechelus, Kachess, Clealum, and Bumping lakes and at McAllister's Meadows on Tieton River. The development of the projects will be made in several units. The first was started by the purchase of the Sunnyside canal, which diverts water from Yakima River below Union Gap. The second unit is the Tieton project, which diverts water from Tieton River for the benefit of land to the west of North Yakima. As Tieton River is the principal tributary of the Naches, whose natural flow has been entirely appropriated for irrigation through private enterprises, the water to be taken from the Tieton will be replaced by the release of water from the Bumping Lake reservoir. Other units are the Wapato project, which contemplates the enlargement and extension of two canals built by the United States Indian Office and the development of small storage reservoirs on the headwaters of Toppenish Creek and Kittitas unit for the irrigation of lands in Kittitas Valley.

The intensive agriculture of this valley has rendered necessary the development of water powers. Several water-power plants are in successful operation, the largest being the plant of the Wapatox Co. Water is taken from Naches River in a long canal and used both for water power and irrigation.

Records of stream flow have been maintained in this valley since 1893. The year 1905 was the driest year since records have been obtained; 1903 was a wet year.

KEECHELUS LAKE NEAR MARTIN, WASH.

A gage was established in Keechelus Lake January 12, 1906, just above the outlet of the lake, 4 miles northwest of Martin, Wash., on the old State road over Snoqualmie Pass.

The gage as originally established was 300 feet from the outlet of the lake at an arbitrary datum. When the dam at the outlet was completed in the winter of 1906–7, the gage was moved, and now

indicates the height above the sill of the outlet tunnels in the dam. All records have been corrected to this latter datum, which is 2,457 feet above sea level.

Daily gage height, in feet, of Keechelus Lake near Martin, Wash., for 1910.

[Christian Hansen, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	11.36	11.60	12.05	11.62	11.88	12.14	11.44	11.10	6.28	2.58	3.80	9.77
2	11.35	11.52	11.92	11.70	11.83	12.06	11.43	11.10	6.18	2.90	3.70	9.65
3	11.34	11.47	11.85	11.68	11.83	11.94	11.42	11.09	6.08	3.75	3.75	9.61
4	11.34	11.39	11.84	11.53	11.88	11.87	11.41	11.09	6.00	5.10	3.80	9.46
5	11.32	11.36	11.83	11.37	11.91	11.84	11.40	11.08	5.85	5.55	3.75	9.40
6	11.32	11.34	11.83	11.59	11.96	11.81	11.38	11.08	5.72	5.65	3.95	.....
7	11.30	11.33	11.76	11.62	12.22	11.79	11.36	11.08	5.62	6.05	5.00	.....
8	11.30	11.32	11.66	11.64	12.48	11.76	11.35	11.08	5.45	6.05	5.45	.....
9	11.29	11.31	11.60	11.62	12.60	11.78	11.34	11.08	5.25	5.80	5.95	.....
10	11.28	11.32	11.54	11.62	12.92	11.81	11.33	11.09	4.95	5.45	6.42	.....
11	11.27	11.34	11.53	11.66	13.15	12.01	11.31	11.10	4.70	5.03	7.41	.....
12	11.26	11.33	11.52	11.74	12.90	11.96	11.30	11.10	4.40	4.75	7.64	.....
13	11.25	11.36	11.61	11.80	12.56	11.87	11.28	11.10	3.95	4.45	7.54	.....
14	11.24	11.32	11.74	11.79	12.38	11.76	11.26	11.10	3.75	4.25	8.04	.....
15	11.24	11.34	12.09	11.73	12.23	11.72	11.24	11.12	3.45	3.95	8.55	.....
16	11.22	11.31	12.11	11.72	12.07	11.69	11.22	11.12	3.15	3.75	9.00	.....
17	11.20	11.33	12.16	11.76	12.06	11.66	11.22	11.10	2.95	3.80	9.35	.....
18	11.32	11.30	12.22	11.84	12.15	11.64	11.20	11.10	2.75	4.05	9.60	.....
19	11.32	11.28	12.28	11.95	12.15	11.61	11.20	11.10	2.55	4.10	9.80	.....
20	11.29	11.28	12.39	12.23	12.06	11.62	11.19	11.10	2.45	4.00	10.50	.....
21	11.29	11.31	12.37	12.32	12.02	11.60	11.18	11.10	2.35	3.90	12.65	.....
22	11.40	11.25	12.32	12.20	12.10	11.56	11.18	10.78	2.25	3.75	12.55	.....
23	11.58	11.33	12.22	12.21	12.22	11.52	11.17	10.28	2.15	3.65	11.55	.....
24	11.86	11.36	12.09	12.42	12.22	11.50	11.17	9.87	2.05	3.65	11.35	8.26
25	11.85	11.34	11.96	12.74	12.17	11.50	11.16	9.47	1.95	4.30	11.05	8.27
26	11.76	11.37	11.85	12.82	12.17	11.50	11.16	9.08	1.90	4.50	10.88	8.43
27	11.68	11.42	11.76	12.52	12.14	11.50	11.14	8.78	1.80	4.40	10.65	8.46
28	11.61	11.44	11.73	12.25	12.05	11.48	11.09	8.65	1.85	4.30	10.38	8.64
29	11.55	.....	11.66	12.07	12.02	11.47	11.08	7.98	2.05	4.15	10.14	8.69
30	11.60	.....	11.62	11.95	12.02	11.46	11.08	7.88	2.25	4.00	9.97	8.83
31	11.66	.....	11.62	.....	12.09	.....	11.08	6.78	2.58	3.90	.....	8.81

Volume of storage on Keechelus Lake near Martin, Wash., for 1909–10.

Gage height.	Storage.	Gage height.	Storage.	Gage height.	Storage
Feet.	*Acre-feet.*	*Feet.*	*Acre-feet.*	*Feet.*	*Acre-feet.*
0.00	0	5.00	7,100	10.00	14,500
1.00	1,400	6.00	8,550	11.00	16,000
2.00	2,800	7.00	10,000	12.00	17,500
3.00	4,200	8.00	11,500	13.00	19,050
4.00	5,650	9.00	13,000	14.00	20,600

NOTE.—This table has been used to determine the amount of water stored in or drawn from the lake and in connection with the records on Yakima River near Martin to compute the inflow into the lake

This table differs slightly from that published in Water-Supply Paper 252. It is the same as is now used by the United States Reclamation Service.

YAKIMA RIVER NEAR MARTIN, WASH.

This station, which is located at the outlet of Keechelus Lake, 4 miles northwest of Martin station, on the Northern Pacific Railway, was established October 18, 1903.

On November 14, 1903, the staff gage was destroyed and records were discontinued until January 28, 1904, when a new vertical staff, at a new datum, was installed 75 feet above the old site, about 1,000

feet below the outlet of the lake and about 800 feet below the dam, 2,448.76 feet above sea level. The datum of this gage has remained unchanged. All gage heights in 1903 were reduced to the datum of this gage.

Discharge measurements are made from a cable 100 feet below the gage, and by wading.

The conditions at the station are favorable for obtaining good results. During the winter months, although the lake freezes, the channel at the station is kept open by the rapid velocities of the stream.

Discharge measurement of Yakima River near Martin, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 1	H. D. McGlashan	118	305	8.3	803
21	do	114	209	7.32	359
July 12[a]	McGlashan and Storey	68	126	6.78	150
Aug. 18[a]	H. Kimble	65	54.3	6.24	57.4
18[a]	do	65	53	6.24	58.3
30	do	103	229	7.54	434
Sept. 8[a]	do	109	170	6.99	209
15	do	112	182	7.12	242

[a] Measured by wading.

Daily gage height, in feet, of Yakima River, near Martin, Wash., for 1910.

[Christian Hansen, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.75	8.22	7.24	7.29	7.78	8.25	6.96	6.38	6.90	6.52	7.24	7.36
2	6.73	7.06	8.08	7.40	7.70	8.10	6.96	6.36	7.00	7.45	7.22	7.32
3	6.71	6.92	7.83	7.36	7.72	7.88	6.92	6.36	6.98	7.76	7.22	7.32
4	6.66	6.84	7.78	7.22	7.78	7.74	6.92	6.35	6.95	7.86	7.22	7.25
5	6.59	6.76	7.71	7.16	7.82	7.70	6.88	6.34	6.98	7.94	7.25	7.22
6	6.55	6.70	7.66	7.24	7.85	7.67	6.88	6.33	6.95	7.92	6.61	.....
7	6.52	6.66	7.48	7.28	8.15	7.65	6.86	6.32	7.05	8.09	6.92	.....
8	6.52	6.65	7.33	7.32	8.48	7.63	6.84	6.32	7.00	8.08	8.09	.....
9	6.50	6.64	7.19	7.31	8.69	7.60	6.83	6.30	7.04	8.00	8.07	.....
10	6.50	6.66	7.12	7.32	9.34	7.65	6.82	6.30	7.22	7.92	8.21	.....
11	6.49	6.72	7.10	7.38	9.69	7.86	6.80	6.30	7.21	7.84	8.34	.....
12	6.48	6.72	7.08	7.51	9.39	7.96	6.78	6.30	7.16	7.65	8.34	.....
13	6.48	6.78	7.24	7.62	8.91	7.75	6.76	6.30	7.26	7.52	7.11	.....
14	6.46	6.68	7.53	7.60	8.66	7.61	6.72	6.30	7.14	7.42	.....	.....
15	6.46	6.72	8.19	7.53	8.36	7.53	6.70	6.30	7.11	7.33	.....	.....
16	6.45	6.68	8.21	7.50	8.15	7.48	6.68	6.30	7.00	7.25	.....	.....
17	6.45	6.71	8.28	7.56	8.13	7.39	6.68	6.28	6.92	7.27	.....	.....
18	6.66	6.68	8.36	7.68	8.27	7.31	6.68	6.28	6.86	7.37	.....	.....
19	6.66	6.64	8.46	7.85	8.28	7.32	6.66	6.28	6.78	7.38	7.45	.....
20	6.58	6.65	8.62	8.36	8.12	7.34	6.65	6.28	6.72	7.34	7.65	.....
21	6.60	6.68	8.58	8.54	8.07	7.30	6.64	6.28	6.66	7.30	9.95	.....
22	6.83	6.61	8.52	8.35	8.15	7.23	6.64	7.62	6.62	7.25	9.75	.....
23	7.16	6.70	8.37	8.33	8.38	7.15	6.59	7.56	6.57	7.21	8.28	.....
24	7.66	6.76	8.16	8.72	8.57	7.13	6.55	7.50	6.53	7.22	8.15	7.26
25	7.65	6.71	7.90	9.18	8.40	7.13	6.52	7.45	6.50	7.45	7.95	7.25
26	7.50	6.76	7.68	9.51	8.35	7.13	6.50	7.28	6.46	7.53	7.78	7.22
27	7.36	6.88	7.49	8.96	8.27	7.11	6.46	7.20	6.44	7.52	7.70	7.16
28	7.24	6.89	7.45	8.39	8.05	7.06	6.41	7.00	6.40	7.49	7.60	7.08
29	7.12	.....	7.34	8.14	8.06	7.01	6.40	6.92	6.38	7.41	7.51	6.97
30	7.22	.....	7.28	7.97	8.04	6.98	6.40	7.00	6.37	7.32	7.42	6.94
31	7.33	.....	7.29	.....	8.12	.....	6.40	6.92	.....	7.27	.....	6.97

NOTE.—The river was dry, Nov. 14 to 18. No record, Dec. 6 to 23.

Daily discharge, in second-feet, of Yakima River near Martin, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	146	781	295	314	525	800	201	77	184	100	294	342
2	142	232	693	358	484	705	201	74	213	379	280	326
3	137	190	552	342	494	579	190	74	207	516	288	326
4	127	168	525	288	525	504	190	72	190	568	288	299
5	113	149	489	266	546	484	179	71	207	612	299	288
6	106	135	467	295	562	471	179	70	198	623	117	300
7	100	127	392	310	736	463	174	68	229	699	190	300
8	100	125	330	326	960	455	168	68	213	693	699	300
9	96	123	276	322	1,120	442	166	65	226	645	687	300
10	96	127	252	326	1,650	463	163	65	288	601	774	300
11	94	140	245	350	1,960	623	158	65	284	557	860	300
12	93	140	239	404	1,690	623	153	65	266	463	860	300
13	93	153	295	450	1,290	510	149	65	303	408	248	300
14	90	131	413	442	1,100	446	140	65	259	366	0	300
15	90	140	762	413	873	413	135	65	248	330	0	300
16	88	131	774	400	736	392	131	65	213	299	0	300
17	88	137	820	425	724	354	131	62	190	307	0	300
18	127	131	873	476	814	322	131	62	174	346	0	300
19	127	123	945	562	820	326	127	62	153	350	379	300
20	111	125	1,060	873	718	334	125	62	140	334	463	300
21	115	131	1,040	1,000	687	318	123	62	127	318	2,200	300
22	166	117	990	866	736	291	123	450	119	299	2,020	300
23	266	135	880	853	886	262	113	425	109	284	820	300
24	467	149	743	1,140	1,030	256	106	400	102	288	736	303
25	463	137	590	1,500	900	256	100	379	96	379	618	299
26	400	149	476	1,800	866	256	96	310	90	413	525	288
27	342	179	396	1,330	814	248	90	280	86	408	484	266
28	295	181	379	893	681	232	82	213	80	396	442	239
29	252	.....	334	730	681	216	80	190	77	362	404	204
30	288	.....	310	628	669	207	80	213	76	326	366	196
31	330	.....	314	.....	718	.....	80	190	.....	307	.....	204

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Yakima River near Martin, Wash., for 1910.

[Drainage area, 56 square miles.]

Month.	Discharge in second-feet.			Run-off (total in acre feet).			Discharge without storage, second-feet.		Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.		
January	467	88	179	11,000	+ 450	11,400	186	3.32	3.82	A.
February	781	123	167	9,280	− 330	8,950	161	2.88	3.00	A.
March	1,060	239	553	34,000	+ 270	34,300	558	9.96	11.48	A.
April	1,800	266	623	37,100	+ 495	37,600	632	11.3	12.61	A.
May	1,960	484	871	53,600	+ 215	53,800	875	15.6	17.99	A.
June	800	207	408	24,200	− 950	23,200	390	6.97	7.78	A.
July	201	80	138	8,480	− 570	7,910	129	2.30	2.65	A.
August	450	62	144	8,850	−6,440	2,410	39.2	.70	.81	A.
September	303	76	178	10,600	−6,060	4,540	76.3	1.36	1.52	A.
October	699	100	419	25,800	+1,890	27,700	450	8.04	9.27	A.
November	2,200	0	511	30,400	+8,950	39,400	662	11.80	13.17	A.
December	342	196	257	15,800	−1,740	14,100	229	4.09	4.72	C.
The year	2,200	0	372	269,000	−3,820	265,000	366	6.54	88.82	

YAKIMA RIVER AT EASTON, WASH.

This station, which is located in sec. 11, T. 20 N., R. 13 E., one-eighth mile northwest of the Northern Pacific Railway station at Easton, Wash., on the road from Easton to Kachess Lake, three-eighth mile below the dam of the Cascade Lumber Co., and 1½ miles below the

mouth of Kachess River, was originally established May 12, 1904, discontinued November 28, 1904, and reestablished February 5, 1910.

The drainage area of Yakima River above this point is 184 square miles.

Discharge measurements are made at the highway bridge to which the chain gage is attached. There is no established relation between the datum of the present gage and that of the gage originally used.

Conditions at the station are favorable for obtaining good results and the record may be considered excellent.

Discharge measurements of Yakima River at Easton, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 11	H. D. McGlashan	158	345	2.90	1,250
27	do	169	644	4.70	3,540
May 31	do	167	415	3.28	1,740
June 20	do	144	212	1.91	518
July 11	McGlashan and Storey	141	155	1.55	265
Aug. 18[a]	H. Kimble	91	143	1.58	301
18[a]	H. D. McGlashan	91	144	1.58	292
30	H. Kimble	138	174	1.65	352
Sept. 15[a]	do	87	141	1.56	285
Oct. 6	F. B. Storey	150	314	2.49	913
Nov. 24	do	170	553	3.86	2,500

[a] Measured by wading.

Daily gage height, in feet, of Yakima River at Easton, Wash., for 1910.

[D. W. Pless, observer.]

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.45	2.90	3.65	3.30	1.64	1.98	1.91	1.10	2.16	2.70
2	.....	2.90	3.00	3.60	3.10	1.62	1.98	1.71	1.14	2.16	2.60
3	.....	3.20	2.95	3.50	3.00	1.58	2.08	1.74	1.90	2.20	2.56
4	.....	3.30	2.90	3.60	3.00	1.57	2.11	1.70	2.50	2.15	2.50
5	2.05	3.10	2.85	3.65	2.95	1.54	2.12	1.65	2.42	2.07	2.46
6	2.00	2.95	2.85	3.80	2.90	1.54	2.12	1.58	2.49	2.07	2.38
7	1.95	2.90	2.90	3.90	2.90	1.52	2.13	1.54	2.42	2.10	2.35
8	1.90	2.85	2.90	4.20	2.90	1.48	2.11	1.69	2.42	2.65	2.35
9	1.90	2.75	2.85	4.40	2.85	1.46	2.06	1.64	2.73	2.87	2.30
10	1.85	2.65	2.85	5.00	2.90	1.45	1.92	1.70	2.60	3.12	2.25
11	1.85	2.60	2.90	5.10	3.00	1.46	1.72	1.70	2.54	3.37	2.20
12	1.85	2.55	2.95	4.90	2.80	1.44	1.58	1.65	2.42	3.30	2.16
13	1.85	2.85	3.05	4.70	2.80	1.54	1.54	1.70	2.30	3.22	2.11
14	1.90	2.95	3.00	4.40	2.70	1.44	1.52	1.74	2.23	2.42	2.05
15	1.80	3.05	2.95	4.00	2.70	1.44	1.51	.....	2.25	2.03	2.02
16	1.85	3.15	2.95	3.80	2.60	1.42	1.50	1.50	2.30	2.03	1.98
17	1.85	3.35	3.00	3.70	2.00	1.34	1.52	1.47	2.30	2.02	1.95
18	1.85	3.70	3.05	3.80	1.95	1.27	1.52	1.40	2.34	1.98	1.90
19	1.75	3.90	3.40	3.80	1.95	1.26	1.47	1.32	2.36	1.65	1.88
20	1.80	4.45	4.00	3.70	1.93	1.26	1.46	1.24	2.35	2.65	1.82
21	1.75	4.40	4.05	3.60	1.96	1.24	1.44	1.16	2.34	4.15	1.81
22	1.70	4.40	4.10	3.60	1.89	1.22	1.88	1.09	2.32	4.38	1.80
23	.....	4.10	4.20	3.70	1.81	1.79	2.04	1.00	2.30	4.48	1.85
24	.....	3.95	4.70	3.80	1.80	1.80	1.97	1.01	2.30	3.72	1.90
25	.....	3.80	5.00	3.80	1.76	1.81	1.90	1.10	2.30	3.45	1.94
26	.....	3.40	5.20	3.70	1.76	1.82	1.94	1.10	2.29	3.23	1.98
27	1.95	3.30	4.75	3.70	1.77	1.83	1.86	1.12	2.31	3.15	2.00
28	2.10	3.20	4.70	3.75	1.76	1.82	1.78	1.09	2.20	3.00	2.02
29	.....	3.00	4.00	3.45	1.68	1.78	1.69	1.10	2.20	2.84	1.99
30	.....	3.00	3.70	3.30	1.64	1.78	1.61	1.09	2.15	2.80	1.99
31	.....	3.00	.....	3.25	.....	2.01	1.90	.....	2.15	.....	1.99

NOTE.—No readings Feb. 23 to 26, as observer could not reach gage on account of snow and ice. Gage heights probably not affected by ice.

Daily discharge, in second-feet, of Yakima River at Easton, Wash., for 1910.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	882	1,320	2,150	1,750	330	538	492	114	662	1,120
2	.....	1,320	1,420	2,090	1,530	318	538	370	124	662	1,020
3	.....	1,640	1,370	1,970	1,420	297	606	388	486	690	977
4	.....	1,750	1,320	2,090	1,420	291	627	364	920	655	920
5	586	1,530	1,260	2,150	1,370	276	634	336	857	599	890
6	551	1,370	1,260	2,330	1,320	276	634	297	912	599	826
7	518	1,320	1,320	2,460	1,320	265	641	276	857	620	803
8	486	1,260	1,320	2,840	1,320	246	627	358	857	1,060	803
9	486	1,160	1,260	3,110	1,260	236	592	330	1,140	1,280	765
10	455	1,060	1,260	4,020	1,320	232	499	364	1,020	1,550	728
11	455	1,020	1,320	4,200	1,420	236	376	364	958	1,830	690
12	455	968	1,370	3,860	1,220	227	297	336	857	1,750	662
13	455	1,260	1,480	3,540	1,220	276	276	364	765	1,660	627
14	486	1,370	1,420	3,110	1,120	227	265	388	712	857	586
15	424	1,480	1,370	2,580	1,120	227	260	320	728	572	565
16	455	1,580	1,370	2,330	1,020	217	255	255	765	572	538
17	455	1,800	1,420	2,210	551	183	265	241	765	565	518
18	455	2,210	1,480	2,330	518	161	265	208	795	538	486
19	394	2,460	1,860	2,330	518	158	241	176	811	336	474
20	424	3,180	2,580	2,210	506	158	236	151	803	1,070	436
21	394	3,110	2,640	2,090	525	151	227	129	795	2,780	430
22	364	3,110	2,710	2,090	480	145	474	112	780	3,080	424
23	395	2,710	2,840	2,210	430	418	579	97	765	3,220	455
24	426	2,520	3,540	2,330	424	424	532	99	765	2,230	486
25	457	2,330	4,020	2,330	400	430	486	114	765	1,920	512
26	488	1,860	4,360	2,210	400	436	512	114	758	1,670	538
27	518	1,750	3,620	2,210	406	443	461	119	773	1,580	551
28	620	1,640	3,540	2,270	400	436	412	112	690	1,420	565
29	.....	1,420	2,580	1,920	353	412	358	114	690	1,260	544
30	.....	1,420	2,210	1,750	330	412	313	112	655	1,220	544
31	.....	1,420	.....	1,700	.....	558	486	.....	655	.....	544

NOTE.—Daily discharge determined from a rating curve well defined between 250 and 3,500 second-feet.

Monthly discharge of Yakima River at Easton, Wash., for 1910.

[Drainage area, 184 square miles.]

Month.	Discharge in second-feet.			Run-off (in acre-feet).			Discharge without storage, second-feet.		Depth in inches.	Accuracy.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Mean per square mile.		
January	.....	.....	.....	.....	.....	.....	.....	.....	.....	
February (24 days)	620	364	467	22,200	− 195	22,000	462	2.51	2.24	B.
March	3,180	882	1,740	107,000	+ 4,960	112,000	1,820	9.90	11.41	A.
April	4,360	1,260	2,080	121,000	+ 5,220	126,000	2,120	11.50	12.80	A.
May	4,200	1,700	2,490	153,000	− 2,760	150,000	2,440	13.3	15.33	A.
June	1,750	330	913	54,300	+ 1,500	55,800	938	5.10	5.69	A.
July	558	145	294	18,100	+ 690	18,800	306	1.66	1.91	B.
August	641	227	436	26,800	−19,800	7,000	114	.620	.71	A.
September	492	97	250	14,900	− 6,420	8,500	143	.778	.87	B.
October	1,150	114	753	46,300	+ 6,440	52,700	857	4.66	5.37	A.
November	3,220	336	1,280	76,200	+13,200	89,400	1,500	8.16	9.10	A.
December	1,120	424	646	39,700	− 7,440	32,300	525	2.85	3.29	A.
The period	4,360	97	1,040	680,000	.....	674,000	.....	.....	.....	

YAKIMA RIVER AT CLEALUM, WASH.

The station, which is located in sec. 27, T. 20 N., R. 15 E., at the highway bridge just above the town of Clealum, Wash., 6 miles above the mouth of Teanaway River and 3 miles below the mouth of Clealum River, was established August 26, 1906, to obtain data to be used in determining the most economic method of operating the storage reservoirs contemplated and under construction on the headwaters by the United States Reclamation Service. The records also show the combined flow of the three rivers forming the headwaters of Yakima River.

A chain gage on the highway bridge, from which discharge measurements are made, was used until August 12, 1910, when it was replaced by a staff gage, the datum of which is 0.12 foot higher than that of the chain gage. All observations made during 1910 have been reduced to the staff-gage datum.

Ice sometimes affects the gage heights for a short period during the winter months. At such times, and where other means fail, the data are usually supplied by interpolation. During 1910 the effect of ice was negligible.

A good rating has been secured and the record may be considered excellent.

Discharge measurements of Yakima River at Clealum, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 26	H. D. McGlashan	226	1,190	5.28	4,730
Apr. 28	do	233	1,510	6.65	8,260
Apr. 29	do	229	1,410	5.99	6,660
June 22	do	207	716	3.37	1,730
July 27	McGlashan and Storey	190	536	2.56	910
Aug. 19	H. Kimble	202	605	2.89	1,190
19	H. D. McGlashan	202	604	2.89	1,200
Sept. 16[a]	H. Kimble	195	404	1.80	503
Oct. 6	F. B. Storey	210	741	3.56	1,860
Nov. 23	do	238	1,520	6.81	8,590

[a] Measured by wading.

Daily gage height, in feet, of Yakima River at Clealum, Wash., for 1910.

[T. J. Denny, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.32	3.13	3.16	4.45	5.35	5.19	3.00	2.50	2.42	1.52	3.20	3.95
2	3.22	2.94	3.76	4.48	5.07	5.18	2.99	2.47	2.35	1.72	3.15	3.90
3	3.24	2.98	4.18	4.37	5.02	4.82	2.98	2.54	2.28	2.30	3.10	3.80
4	3.26	2.95	4.20	4.22	5.04	4.58	2.98	2.53	2.20	3.15	3.10	3.75
5	3.20	2.95	4.11	4.19	5.15	4.45	3.00	2.58	2.15	3.40	3.05	3.70
6	3.18	2.82	3.94	4.22	5.36	4.50	2.98	2.54	2.08	3.55	3.20	3.65
7	3.03	2.90	3.78	4.25	5.81	4.41	2.96	2.68	2.00	3.65	3.38	3.60
8	3.10	2.80	3.66	4.36	6.21	4.27	2.93	2.64	2.20	3.85	3.70	3.55
9	3.04	2.78	3.58	4.31	6.41	4.14	2.96	2.58	2.05	3.95	4.05	3.50
10	2.98	2.77	3.58	4.31	6.84	4.14	2.98	2.70	2.05	3.95	4.15	3.50
11	2.90	2.73	3.64	4.38	7.30	4.36	3.03	2.80	2.10	3.40	4.50	3.40
12	2.95	2.68	3.69	4.58	7.03	4.68	3.04	2.80	2.08	3.50	4.50	3.38
13	2.84	2.74	3.90	4.72	6.57	4.63	3.03	2.93	2.00	3.30	4.50	3.30
14	2.76	2.70	4.18	4.70	6.17	4.40	2.99	2.85	2.02	3.15	4.00	3.20
15	2.73	2.73	4.48	4.56	5.79	4.28	2.87	2.90	1.95	3.20	3.80	3.18
16	2.63	2.67	4.96	4.55	5.51	4.12	2.76	2.90	1.90	3.60	3.70	3.05
17	2.66	2.66	5.24	4.60	5.34	4.02	2.73	2.85	1.85	3.65	3.65	2.98
18	2.58	2.68	5.50	4.80	5.44	3.75	2.70	2.85	1.79	3.50	3.55	2.82
19	2.72	2.63	5.78	5.23	5.54	3.58	2.60	2.85	1.74	3.75	3.50	2.80
20	2.73	2.60	6.36	5.93	5.38	3.56	2.50	2.95	1.70	3.65	3.90	2.72
21	2.68	2.63	6.66	6.23	5.25	3.48	2.44	3.00	1.69	3.60	5.05	2.75
22	2.68	2.68	6.60	6.06	5.28	3.34	2.40	3.05	1.65	3.60	7.30	2.72
23	2.80	2.63	6.30	5.99	5.55	3.26	2.60	3.20	1.65	3.30	6.65	2.75
24	3.02	2.64	5.98	6.42	5.88	3.16	2.66	2.90	1.60	3.20	5.85	2.95
25	3.14	2.66	.....	7.14	6.00	3.06	2.54	2.70	1.60	3.25	5.25	3.00
26	3.12	2.68	5.28	7.76	5.74	3.14	2.56	2.70	1.60	3.40	4.85	3.00
27	3.09	2.75	4.96	7.42	5.47	3.24	2.54	2.60	1.55	3.45	4.55	3.00
28	3.09	2.87	4.83	6.69	5.12	3.20	2.48	2.60	1.50	3.40	4.35	3.00
29	3.02	.....	4.65	6.06	4.91	3.12	2.45	2.50	1.50	3.35	4.15	2.95
30	3.02	.....	4.51	6.63	4.89	3.08	2.46	2.42	1.50	3.30	4.05	2.92
31	3.10	.....	4.46	.....	4.97	.....	2.54	2.50	.....	3.25	.....	2.90

NOTE.—There was a small amount of slush and shore ice during January and February, which probably had no effect on the gage readings. These gage heights refer to a datum 0.12 foot higher than that used previous to 1910.

Daily discharge, in second-feet, of Yakima River at Clealum, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,620	1,420	1,450	3,140	4,800	4,480	1,290	859	800	297	1,490	2,390
2	1,510	1,230	2,140	3,190	4,240	4,460	1,280	837	750	372	1,440	2,320
3	1,530	1,270	2,720	3,010	4,150	3,780	1,270	891	700	714	1,390	2,190
4	1,550	1,240	2,750	2,780	4,190	3,360	1,270	883	645	1,440	1,390	2,120
5	1,490	1,240	2,620	2,740	4,400	3,140	1,290	922	612	1,700	1,340	2,060
6	1,470	1,120	2,380	2,780	4,830	3,220	1,270	891	567	1,870	1,490	2,000
7	1,320	1,200	2,160	2,820	5,840	3,080	1,250	1,000	517	2,000	1,680	1,930
8	1,390	1,100	2,010	3,000	6,870	2,860	1,220	971	645	2,260	2,060	1,870
9	1,330	1,090	1,910	2,920	7,410	2,660	1,250	922	548	2,390	2,530	1,810
10	1,270	1,080	1,910	2,920	8,630	2,660	1,270	1,020	548	2,390	2,680	1,810
11	1,200	1,050	1,980	3,030	10,000	3,000	1,320	1,100	580	1,700	3,220	1,700
12	1,240	1,000	2,050	3,360	9,190	3,530	1,330	1,100	567	1,810	3,220	1,680
13	1,140	1,050	2,320	3,600	7,850	3,440	1,320	1,220	517	1,600	3,220	1,600
14	1,070	1,020	2,720	3,560	6,760	3,060	1,280	1,150	530	1,440	2,460	1,490
15	1,050	1,050	3,190	3,320	5,790	2,870	1,170	1,200	488	1,490	2,190	1,470
16	963	995	4,030	3,300	5,140	2,630	1,070	1,200	460	1,930	2,060	1,340
17	987	987	4,580	3,390	4,780	2,490	1,050	1,150	435	2,000	2,000	1,270
18	922	1,000	5,120	3,740	4,990	2,120	1,020	1,150	404	1,810	1,870	1,120
19	1,040	963	5,760	4,560	5,210	1,910	938	1,150	381	2,120	1,810	1,100
20	1,050	938	7,270	6,140	4,870	1,880	859	1,240	363	2,000	2,320	1,040
21	1,000	963	8,100	6,920	4,600	1,790	815	1,290	359	1,930	4,200	1,060
22	1,000	1,000	7,930	6,480	4,660	1,640	785	1,340	344	1,930	10,000	1,040
23	1,100	963	7,110	6,290	5,230	1,550	938	1,490	344	1,600	8,080	1,060
24	1,310	971	6,270	7,430	6,010	1,450	987	1,200	324	1,490	5,940	1,240
25	1,430	987	5,460	9,540	6,320	1,350	891	1,020	324	1,540	4,600	1,290
26	1,410	1,000	4,660	11,600	5,670	1,430	906	1,020	324	1,700	3,830	1,290
27	1,380	1,060	4,030	10,400	5,060	1,530	891	938	307	1,760	3,300	1,290
28	1,380	1,170	3,790	8,190	4,340	1,490	844	938	290	1,700	2,980	1,290
29	1,310	.....	3,480	6,480	3,940	1,410	822	859	290	1,650	2,680	1,240
30	1,310	.....	3,240	8,020	3,900	1,370	829	800	290	1,600	2,530	1,210
31	1,390	.....	3,160	.....	4,050	.....	891	859	.....	1,540	.....	1,200

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Yakima River at Clealum, Wash., for 1910.

[Drainage area, 500 square miles.]

Month.	Discharge in second-feet.			Run-off (total in acre-feet).			Discharge without storage, second-feet.		Depth in inches on drainage area.	Accuracy.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.		
January	1,620	922	1,260	77,500	− 5,680	71,800	1,170	2.34	2.70	A.
February	1,420	938	1,080	60,000	− 490	59,500	1,070	2.14	2.23	A.
March	8,100	1,450	3,820	235,000	+18,700	254,000	4,130	8.26	9.52	A.
April	11,600	2,740	4,960	295,000	+ 7,020	302,000	5,080	10.2	11.38	A.
May	10,000	3,900	5,600	344,000	− 2,520	341,000	5,550	11.1	12.80	A.
June	4,480	1,350	2,520	150,000	− 540	149,000	2,500	5.00	5.58	A.
July	1,330	785	1,080	66,400	− 510	65,900	1,070	2.14	2.47	A.
August	1,490	800	1,050	64,600	−41,200	23,400	381	.762	.88	A.
September	800	290	475	28,300	− 7,460	20,800	350	.700	.78	A.
October	2,390	297	1,670	103,000	+20,700	124,000	2,020	4.04	4.66	A.
November	10,000	1,340	3,000	179,000	+18,300	197,000	3,310	6.62	7.39	A.
December	2,390	1,040	1,530	94,100	−23,400	70,700	1,150	2.30	2.65	A.
The year	11,600	290	2,340	1,700,000	−17,100	1,680,000	2,320	4.64	63.04	

YAKIMA RIVER AT UMTANUM, WASH.

The station, which is located in unsurveyed sec. 20, T. 14 N., R. 19 E., at Umtanum, Wash., in the canyon of Yakima River between the Kittitas and Selah valleys, 1 mile above the mouth of Umtanum Creek, was established August 25, 1906. The records indicate the amount of water available from Yakima River for the Selah and Moxee valleys, and show also the amount passing the Kittitas Valley after all seepage waters from irrigation are returned to the river. The records are also extensively used during the irrigating season at this point in conjunction with those at Clealum and Union Gap in studying the most economic method of operating storage reservoirs which are contemplated and under construction for the irrigation of the valley.

Discharge measurements are made from a cable 75 feet upstream from the cantilever chain gage which was installed in 1910.

The conditions are favorable for good results and the data obtained are reliable. A riffle control is located about 300 feet below the gaging section, and the gage height is a good index of the flow. Gage heights are somewhat affected during the winter months by ice, but, as the ice periods are short and do not occur at critical stages, the errors due to this cause are not great.

Discharge measurements of Yakima River at Umtanum, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 15	H. D. McGlashan	246	1,280	6.12	5,460
29	do	251	1,580	7.3	9,650
June 10	do	243	938	5.08	3,020
23	do	240	774	4.45	1,800
July 28	do	237	562	3.54	704
28	F. B. Storey	237	571	3.54	729

Daily gage height, in feet, of Yakima River at Umtanum, Wash., for 1910.

[B. F. Cummings, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.40	4.50	5.82	6.00	6.40	5.75	4.00	3.43	3.58	3.10	4.36	5.08
2	4.40	4.50	5.68	6.10	6.15	5.90	4.00	3.45	3.58	3.10	4.33	5.02
3	4.30	4.35	6.75	6.00	6.05	5.75	4.00	3.45	3.54	3.20	4.30	5.02
4	4.25	4.25	6.75	6.00	5.95	5.45	4.00	3.44	3.48	3.78	4.34	5.00
5	4.20	4.20	6.25	5.95	6.60	5.20	4.00	3.46	3.41	4.28	4.35	4.97
6	4.20	4.30	5.75	5.90	7.20	5.30	3.90	3.56	3.40	4.51	4.42	4.89
7	4.15	4.20	5.70	5.90	7.00	5.25	3.90	3.64	3.37	4.62	4.46	4.85
8	4.10	4.10	5.60	5.90	6.90	5.20	3.95	3.66	3.35	4.71	4.65	4.82
9	4.00	4.10	5.50	5.90	7.15	5.10	4.00	3.64	3.32	4.81	4.83	4.76
10	4.00	4.10	5.50	5.80	7.35	5.05	4.00	3.60	3.34	4.86	5.11	4.70
11	4.00	4.10	5.35	5.90	7.70	5.10	4.02	3.60	3.32	4.86	5.37	4.67
12	3.95	4.10	5.45	6.25	7.65	5.45	4.00	3.63	3.30	4.78	5.46	4.62
13	3.90	4.05	6.15	6.40	7.40	5.45	4.02	3.76	3.30	4.68	5.52	4.58
14	3.80	4.00	6.55	6.30	6.90	5.25	4.00	3.80	3.30	4.49	5.52	4.54
15	3.80	4.00	6.72	6.20	6.65	5.05	3.95	3.80	3.30	4.16	5.48	4.48
16	3.80	4.00	7.05	6.10	6.30	5.00	3.90	3.84	3.30	4.05	5.29	4.44
17	3.80	4.00	7.45	6.20	6.10	4.90	3.82	3.82	3.30	4.06	4.92	4.40
18	3.80	4.00	7.52	6.22	6.05	4.75	3.78	3.81	3.24	4.04	4.67	4.40
19	3.80	4.00	7.70	6.70	6.25	4.60	3.70	3.82	3.22	4.02	4.58	4.38
20	3.80	4.00	8.58	7.25	6.15	4.60	3.70	3.80	3.20	4.01	4.66	4.36
21	3.85	3.90	8.85	7.20	6.00	4.55	3.60	3.83	3.20	4.02	4.88	4.32
22	3.90	3.80	8.70	7.20	5.95	4.50	3.52	3.86	3.16	4.04	6.06	4.29
23	4.30	3.80	8.40	7.20	6.35	4.48	3.50	3.91	3.16	4.17	7.44	4.26
24	4.70	3.90	7.80	7.40	6.35	4.35	3.60	4.01	3.11	4.32	6.68	4.22
25	4.90	3.90	7.35	8.00	6.60	4.15	3.60	4.02	3.10	4.29	6.15	4.23
26	4.95	3.90	6.90	8.45	6.45	4.10	3.60	4.04	3.10	4.32	5.78	4.28
27	4.85	4.00	6.65	8.50	6.25	4.18	3.55	3.98	3.10	4.47	5.44	4.30
28	4.65	4.00	6.58	7.75	6.05	4.20	3.53	3.77	3.09	4.46	5.38	4.29
29	4.45	.....	6.35	7.30	5.75	4.20	3.50	3.75	3.10	4.40	5.22	4.26
30	4.40	.....	6.22	6.85	5.65	4.05	3.46	3.66	3.10	4.41	5.14	4.23
31	4.50	.....	6.10	.....	5.65	.....	3.41	3.59	.....	4.39	.....	4.22

NOTE.—There was a small amount of slush ice in January and February; probably not enough to affect the gage readings.

Daily discharge, in second-feet, of Yakima River at Umtanum, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,740	1,890	4,700	5,190	6,370	4,520	1,220	622	765	365	1,680	2,930
2	1,740	1,890	4,340	5,480	5,620	4,910	1,220	640	765	365	1,640	2,810
3	1,600	1,670	7,540	5,190	5,340	4,520	1,220	640	725	435	1,600	2,810
4	1,530	1,530	7,540	5,190	5,050	3,760	1,220	631	667	969	1,660	2,770
5	1,460	1,460	5,920	5,050	7,020	3,190	1,220	649	604	1,650	1,670	2,710
6	1,460	1,600	4,520	4,910	9,220	3,410	1,100	745	595	1,910	1,770	2,560
7	1,400	1,460	4,390	4,910	8,440	3,300	1,100	825	571	2,080	1,830	2,490
8	1,340	1,340	4,130	4,910	8,070	3,190	1,160	845	555	2,240	2,140	2,440
9	1,220	1,340	3,880	4,910	9,020	2,970	1,220	825	531	2,420	2,450	2,330
10	1,220	1,340	3,880	4,650	9,830	2,870	1,220	785	547	2,510	2,990	2,220
11	1,220	1,340	3,520	4,910	11,400	2,970	1,240	785	531	2,510	3,570	2,170
12	1,160	1,340	3,760	5,920	11,100	3,760	1,220	815	515	2,360	3,780	2,080
13	1,100	1,280	5,620	6,370	10,000	3,760	1,240	948	515	2,190	3,930	2,020
14	990	1,220	6,860	6,070	8,070	3,300	1,220	990	515	1,880	3,930	1,950
15	990	1,220	7,430	5,770	7,190	2,870	1,160	990	515	1,410	3,830	1,860
16	990	1,220	8,630	5,480	6,070	2,770	1,100	1,030	515	1,280	3,390	1,800
17	990	1,220	10,300	5,770	5,480	2,580	1,010	1,010	515	1,290	2,620	1,740
18	990	1,220	10,600	5,830	5,340	2,310	969	1,000	467	1,270	2,170	1,740
19	990	1,220	11,400	7,360	5,920	2,050	885	1,010	451	1,240	2,020	1,710
20	990	1,220	15,400	9,420	5,620	2,050	885	990	435	1,230	2,150	1,680
21	1,040	1,100	16,700	9,220	5,190	1,970	785	1,020	435	1,240	2,540	1,630
22	1,100	990	16,000	9,220	5,050	1,890	705	1,060	407	1,270	5,360	1,590
23	1,600	990	14,600	9,220	6,220	1,860	685	1,110	407	1,420	10,200	1,540
24	2,220	1,100	11,800	10,000	6,220	1,670	785	1,230	372	1,630	7,290	1,490
25	2,580	1,100	9,830	12,700	7,020	1,400	785	1,240	365	1,590	5,620	1,500
26	2,680	1,100	8,070	14,800	6,530	1,340	785	1,270	365	1,630	4,600	1,570
27	2,490	1,220	7,190	15,000	5,920	1,440	735	1,200	365	1,840	3,740	1,600
28	2,140	1,220	6,950	11,600	5,340	1,460	715	958	358	1,830	3,590	1,590
29	1,820	.....	6,220	9,620	4,520	1,460	685	937	365	1,740	3,230	1,540
30	1,740	.....	5,830	7,890	4,260	1,280	649	845	365	1,760	3,060	1,500
31	1,890	.....	5,480	.....	4,260	.....	604	775	.....	1,730	.....	1,490

NOTE.—Daily discharge determined from a rating curve well defined between 400 and 12,000 second-feet.

Monthly discharge of Yakima River at Umtanum, Wash., for 1910.

[Drainage area, 1,540 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	2,680	990	1,500	0.974	1.12	92,200	B.
February	1,890	990	1,320	.857	.89	73,300	B.
March	16,700	3,520	7,840	5.09	5.87	482,000	B.
April	15,000	4,650	7,420	4.82	5.38	442,000	A.
May	11,400	4,260	6,800	4.42	5.10	418,000	A.
June	4,910	1,280	2,690	1.75	1.95	160,000	A.
July	1,240	604	992	.644	.74	61,000	A.
August	1,270	622	917	.595	.69	56,400	A.
September	765	358	503	.327	.36	29,900	A.
October	2,510	365	1,590	1.03	1.19	97,800	B.
November	10,200	1,600	3,340	2.17	2.42	199,000	A.
December	2,930	1,490	2,000	1.30	1.50	123,000	A.
The year	16,700	358	3,080	2.00	27.21	2,230,000	

YAKIMA RIVER NEAR YAKIMA, WASH.

This station, which is located at Union Gap (Pl. III. *B*), a short canyon through Atanum Ridge near Yakima, Wash., was established August 14, 1893, but discharge can be computed only from August 19, 1895, as the records are fragmentary prior to that date. This station was discontinued December 31, 1909, in favor of the Wapato station.

The station is of importance to the determination of the discharge of the river, as it is located at a critical point unaffected by the diversion of water for the large irrigated areas above and below. It is just below the mouth of Atanum Creek and above the headgate of the New Reservation Canal; there is only a short stretch of river in which the station can be located, the distance between these points being less than half a mile.

The canal of the Union Gap Irrigation Co. diverts a small amount of water, about 20 to 25 second-feet, past the station during the summer. The discharge at this point is approximately equal to the sum of the discharge of Yakima River at Umtanum, Naches River at North Yakima, Atanum Creek, the return waters in the Selah and Moxee Valleys, and the waste from the North Yakima power canal. The records show also the amount of water available for the Sunnyside and Old and New Reservation canals, all of which have their intakes a short distance below.

The records were fairly reliable until the flood of November 15, 1906, which so deepened the channel at the measuring section that the current is very sluggish at low water. The flood also deepened a small channel near the left bank, which previously did not carry water except at flood stages, but which now carries a considerable part of the flow even at medium stages. On account of these changes

it has been impossible since the above date to obtain reliable estimates of discharge. The record of gage heights for 1909 was not published as the gage heights were not a true index of the discharge. Daily discharges for 1910 and monthly discharges for 1909 have been computed, however, by adding the flow of the three canals to the flow over the Sunnyside dam.

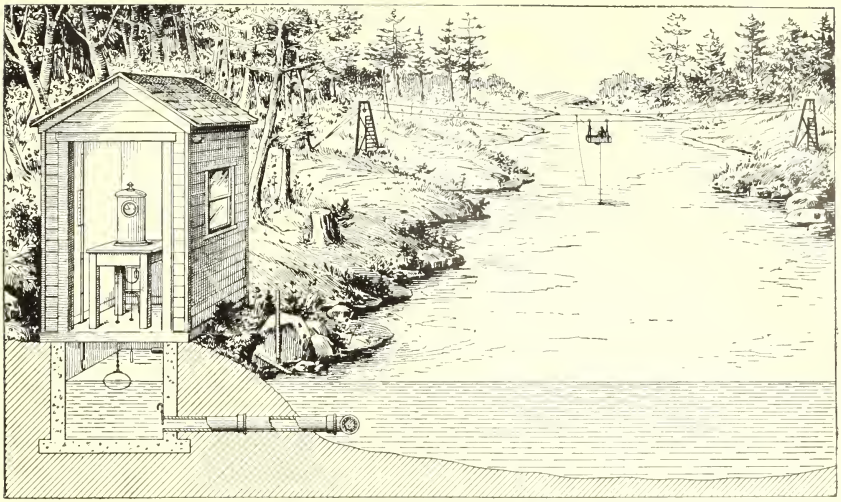
The river frequently freezes during the winter months, and ice jams are common in the vicinity of the station.

Daily discharge, in second-feet, of Yakima River near Yakima, Wash., for 1910.

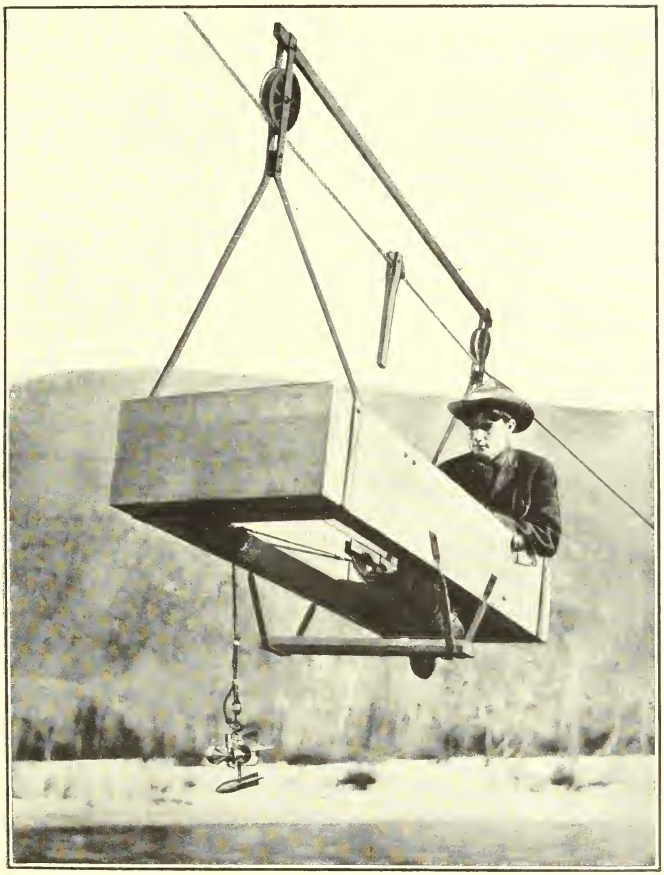
[Drainage area, 3,300 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,020	4,330	4,350	9,370	11,800	9,650	2,900	1,060	965	839	2,310	5,620
2	2,850	3,920	12,100	9,420	10,600	9,970	2,740	1,080	950	844	2,330	5,170
3	2,560	3,410	17,000	8,940	10,100	8,700	2,740	1,070	934	942	2,330	4,790
4	2,450	3,230	15,700	8,070	9,540	7,920	2,710	1,080	884	2,240	2,360	4,560
5	2,300	3,270	12,500	8,260	9,770	7,060	2,710	1,090	824	2,630	2,400	4,420
6	2,420	3,310	9,380	8,310	10,100	7,410	2,540	1,000	815	3,100	2,370	4,420
7	2,720	3,180	8,320	8,420	11,500	7,000	2,340	1,020	839	3,470	2,460	4,380
8	2,800	3,130	7,900	8,420	13,200	6,570	2,620	1,070	746	3,850	2,860	4,420
9	2,750	3,070	7,940	8,450	15,400	6,070	2,770	1,140	737	3,970	4,070	4,220
10	2,660	2,990	7,620	8,400	16,500	5,920	2,630	1,140	772	4,050	4,560	4,200
11	2,520	2,920	8,560	8,840	20,300	6,520	2,760	1,090	762	3,790	8,400	4,180
12	2,280	2,900	9,020	10,000	20,800	7,790	2,710	1,140	789	3,220	7,030	3,900
13	2,180	2,850	10,400	10,700	18,700	7,320	2,620	1,110	817	3,370	6,700	3,630
14	2,050	2,820	12,100	10,500	15,900	6,610	2,490	1,150	812	3,100	6,380	3,130
15	1,970	2,720	13,400	9,850	13,300	6,300	2,380	1,140	797	2,840	5,220	3,230
16	1,930	2,540	14,800	9,330	11,500	6,170	2,220	1,130	815	3,000	3,000	3,160
17	1,950	2,450	15,800	9,480	10,600	5,600	2,000	1,100	860	2,920	4,360	3,070
18	2,050	2,450	17,000	9,840	10,200	5,190	1,890	1,160	853	2,970	4,240	2,920
19	2,210	2,480	18,800	11,600	10,700	4,730	1,810	1,190	843	2,380	3,930	2,520
20	2,230	2,450	24,100	15,000	10,500	4,830	1,720	1,150	829	2,710	4,000	2,500
21	2,260	2,420	28,300	16,700	10,200	4,510	1,590	1,180	854	2,590	7,160	2,450
22	2,280	2,210	26,800	15,900	9,740	4,170	1,500	1,170	901	2,130	14,500	2,390
23	4,760	2,180	24,600	15,900	10,300	3,870	1,450	1,180	912	1,870	15,700	2,450
24	6,140	2,230	20,900	16,900	11,800	3,800	1,410	1,390	893	2,380	13,200	2,570
25	6,010	2,320	17,100	20,600	13,300	3,440	1,400	1,290	962	2,520	9,900	2,680
26	5,590	2,480	14,300	24,500	12,900	3,430	1,470	1,150	918	2,700	8,230	2,600
27	4,990	3,560	12,900	25,200	11,400	3,450	1,330	1,050	853	2,690	7,260	2,560
28	4,840	4,140	11,800	21,200	10,400	3,440	1,310	1,050	827	2,710	6,100	2,560
29	4,380	.....	10,500	16,500	9,270	3,130	1,220	1,060	672	2,700	4,980	2,530
30	4,290	.....	9,780	14,100	9,060	2,980	1,080	1,050	801	2,640	5,590	2,500
31	4,860	.....	9,490	.....	8,970	.....	1,030	1,020	.....	2,530	.....	2,460

NOTE.—Daily discharge computed as the sum of the discharge on Yakima River near Wapato and New Reservation, Old Reservation, and Sunnyside canals. Discharge Aug. 15 interpolated on the above method gave unreasonably large results.



A. CABLE STATION, SHOWING AUTOMATIC GAGE.



B. CABLE CAR, YAKIMA RIVER, UNION GAP, WASH.

Monthly discharge of Yakima River near Yakima, Wash., for 1909–10.

[Drainage area, 3,300 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1909.							
January	3,360	1,470	2,010	0.609	0.70	124,000	B.
February	3,670	1,390	1,860	.564	.59	103,000	A.
March	4,100	1,460	2,190	.664	.77	135,000	A.
April	5,980	3,160	4,320	1.31	1.46	257,000	B.
May	11,500	4,960	7,350	2.23	2.57	452,000	A.
June	17,000	4,740	9,770	2.96	3.30	581,000	A.
July	5,040	1,750	3,240	.982	1.13	199,000	A.
August	1,740	1,020	1,300	.394	.45	79,900	A.
September	1,080	769	919	.278	.31	54,700	A.
October	1,240	991	1,110	.336	.39	68,200	A.
November	33,400	240	8,800	2.67	2.98	524,000	B.
December	27,000	2,800	6,520	1.98	2.28	401,000	A.
The year	33,400	240	4,110	1.25	16.90	2,980,000	
1910.							
January	6,140	1,930	3,170	0.961	1.11	195,000	A.
February	4,330	2,180	2,930	.888	.92	163,000	A.
March	28,300	4,350	14,000	4.24	4.89	861,000	A.
April	25,200	8,070	12,600	3.82	4.26	750,000	A.
May	20,800	8,970	12,200	3.70	4.27	750,000	A.
June	9,970	2,980	5,780	1.75	1.95	344,000	A.
July	2,900	1,030	2,070	.627	.72	127,000	A.
August	1,390	1,000	1,120	.340	.39	68,900	A.
September	965	672	841	.255	.28	50,000	A.
October	4,050	839	2,700	.818	.94	166,000	A.
November	15,700	2,310	5,800	1.76	1.96	345,000	A.
December	5,620	2,390	3,430	1.04	1.20	211,000	A.
The year	28,300	672	5,570	1.69	22.89	4,030,000	

NOTE.—No records have been obtained at Union Gap since 1908. Discharge estimated by combining the estimates for Yakima River near Wapato with those for Sunnyside, Old Reservation, and New Reservation canals. The estimates for Union Gap thus obtained are liable to some error during the nonirrigating season when no records were kept of the flow in the canals.

YAKIMA RIVER NEAR WAPATO, WASH.

This station, which is located in sec. 28, T. 12 N., R. 19 E., just below the head gate of the Sunnyside canal, which is owned and operated by the United States Reclamation Service, 3 miles north of Wapato, Wash., and 8 miles below North Yakima, was established April 25, 1908.

The flow at this point is controlled by a concrete diversion dam 500 feet long, of ogee cross section 7 feet high. A sluiceway in the dam is closed by means of flashboards during the irrigating season. There is also a fish ladder near the sluiceway through which a small quantity of water flows all the time.

Discharge measurements are made from a cable which spans the river 1,000 feet below the dam. Two gages have been read—a hook gage and a chain gage. The hook gage is in the fore bay above the controlling gates for Sunnyside canal and indicates head of water flowing over the dam. An auxiliary gage installed above the dam was used when the hook gage was frozen up, these readings being corrected to the hook-gage datum. The chain gage is located at the cable section

at an arbitrary datum. The readings on both gages for 1910 are published, as they afford an interesting comparison. Owing to variable effect of drift logs on the crest of the dam, the hook-gage heights are not a good index of discharge. Those obtained from the chain gage have therefore been used in determining discharge. The datum of the chain gage has remained unchanged. A good rating has been obtained and the record may be considered excellent.

The discharge at this station, plus the diversions measured in the Sunnyside canal, the Old and New Reservation canals, gives results comparable with records formerly obtained at Union Gap.

Discharge measurements of Yakima River near Wapato, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 6	H. D. McGlashan	289	2,140	5.80	9,260
June 9	do	279	1,750	4.43	5,030
July 1	do	269	1,170	2.44	1,630
21	H. Kimble	265	831	1.15	430
30	do	215	658	.53	177
Aug. 12	R. H. Bolster	217	729	.66	301
23[a]	McGlashan and Kimble	303	327	.64	261
Sept. 5[a]	do	22.5	20.8	− .37	13.5
Oct. 3[a]	F. B. Storey	62	62.7	.12	105

[a] Measured by wading.

Daily gage height, in feet, of Yakima River near Wapato, Wash., for 1910.

[Chain gage. W. R. Newland, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.46	4.16	4.17	5.72	6.13	5.56	2.50	0.43	0.00	−0.25	2.64	4.66
2	3.36	3.96	6.50	5.70	5.81	5.66	2.36	.51	− .25	− .30	2.80	4.49
3	3.17	3.68	7.40	5.56	5.67	5.30	2.36	.45	− .30	+ .10	2.88	4.34
4	3.10	3.58	7.18	5.30	5.72	5.06	2.34	.50	− .35	2.21	2.90	4.24
5	2.99	3.60	6.58	5.32	5.78	4.75	2.34	.60	− .40	2.55	2.93	4.20
6	3.08	3.62	5.84	5.30	5.76	4.85	2.16	.32	− .40	2.91	2.83	4.20
7	3.28	3.55	5.54	5.36	6.12	4.74	2.13	.41	− .40	3.17	2.98	4.18
8	3.33	3.52	5.42	5.36	6.48	4.58	2.17	.48	− .40	3.42	3.25	4.20
9	3.30	3.49	5.43	5.34	6.88	4.39	2.30	.62	− .40	3.48	3.94	4.11
10	3.24	3.44	5.34	5.33	7.09	4.32	2.20	.65	− .40	3.53	4.18	4.10
11	3.15	3.40	5.61	5.44	7.74	4.54	2.30	.54	− .40	3.38	5.51	4.09
12	2.98	3.39	5.74	5.75	7.82	5.00	2.25	.60	− .40	3.00	5.11	.....
13	2.90	3.36	6.11	5.92	7.46	4.82	2.18	1.60	− .40	3.10	5.00	3.79
14	2.80	3.34	6.50	5.88	6.98	4.55	2.05	1.59	− .40	2.91	4.88	3.50
15	2.74	3.28	6.75	5.69	6.48	4.43	1.96	1.48	− .40	2.72	4.44	3.58
16	2.71	3.16	7.02	5.54	6.05	4.38	1.82	.81	− .40	2.86	3.34	3.54
17	2.72	3.10	7.20	5.56	5.81	4.16	1.58	.55	− .15	2.78	4.10	3.49
18	2.80	3.10	7.40	5.66	5.72	3.98	1.45	.48	− .15	2.81	4.05	3.40
19	2.92	3.12	7.70	6.14	5.84	3.73	1.36	.55	− .17	2.30	3.90	3.15
20	2.94	3.10	8.53	6.84	5.80	3.80	1.22	.50	− .21	2.60	3.95	3.13
21	2.96	3.08	9.13	7.16	5.70	3.63	1.06	.62	− .30	2.49	5.18	3.10
22	2.98	2.92	8.92	7.00	5.58	3.44	.92	.59	+ .02	2.06	6.96	3.06
23	4.33	2.90	8.60	7.00	5.73	3.28	.82	.60	.15	1.80	7.18	3.10
24	4.86	2.94	8.05	7.16	6.14	3.22	.73	.98	.08	2.31	6.70	3.18
25	4.81	3.01	7.40	7.78	6.48	2.96	.71	.85	.35	2.44	5.98	3.20
26	4.65	3.12	6.91	8.40	6.38	2.96	.90	.50	.19	2.60	5.51	3.15
27	4.42	3.76	6.63	8.50	6.04	2.96	.84	.09	− .12	2.62	5.23	3.12
28	4.36	4.09	6.39	7.88	5.75	2.94	.90	.16	− .24	2.64	3.09	3.12
29	4.18	.....	6.10	7.09	5.43	2.71	.83	.20	− .40	2.65	4.39	3.10
30	4.14	.....	5.88	6.63	5.39	2.72	.50	.19	− .40	2.60	4.65	3.08
31	4.37	.....	5.79	.....	5.37	.....	.30	.10	.....	2.54	.....	3.05

Daily gage height, in feet, of Yakima River near Wapato, Wash., for 1910—Continued.

[Hook gage. W. R. Newland, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.72	3.29	2.84	3.26	2.76	0.80	0.00	0.00	−0.17	1.06	2.15
2	.....	.....	3.54	2.84	2.96	2.88	.74	.00	.00	− .20	1.16	2.04
3	.....	.....	4.16	2.75	2.88	2.58	.74	.00	.00	− .04	1.22	2.01
4	.....	.....	3.85	2.54	2.84	2.32	.72	.00	.00	+ .82	1.24	1.92
5	.....	.....	3.54	2.50	2.98	2.24	67	.00	.00	1.06	1.26	1.89
6	.....	.....	2.94	2.52	3.00	2.26	.62	.00	.00	1.14	1.19	1.86
7	.....	.....	2.68	2.56	3.26	2.16	.59	.00	.00	1.24	1.26	1.85
8	.....	.....	2.58	2.53	3.58	2.06	.64	.00	.00	1.38	1.40	1.79
9	.....	.....	2.60	2.53	3.87	1.94	.70	.00	.00	1.42	1.74	1.75
10	.....	1.31	2.52	2.50	4.16	1.89	.65	.00	.00	1.46	1.89	1.74
11	.....	1.30	2.74	2.58	4.70	2.04	.67	.00	.00	1.35	2.69	1.71
12	.....	1.28	2.82	2.90	4.73	2.32	.65	.00	.00	1.16	2.46	1.68
13	.....	1.26	3.18	3.02	4.39	2.28	.62	.....	.00	1.22	2.34	1.56
14	.....	1.26	3.47	2.94	4.00	2.06	.57	.68	.00	1.15	2.14	1.52
15	.....	1.23	3.68	2.76	3.54	1.93	.52	.56	.00	1.06	1.99	1.56
16	.....	1.20	3.91	2.68	3.19	1.90	.43	.20	− .11	1.12	1.93	1.53
17	.....	.....	4.16	2.70	2.99	1.78	.32	.00	− .20	1.08	1.84	1.51
18	.....	.....	4.34	2.81	2.90	1.64	.26	.00	− .20	1.16	1.77	1.48
19	.....	.....	4.58	3.23	3.05	1.52	.20	.00	− .26	.85	1.72	1.36
20	.....	.....	5.33	3.82	3.03	1.57	.20	.00	− .32	.98	1.73	1.34
21	.....	.....	5.69	4.04	2.84	1.46	.18	.00	− .12	.95	2.49	1.30
22	.....	.....	5.56	3.90	2.80	1.34	.10	.00	− .07	.82	3.71	1.25
23	.....	.....	5.28	3.82	2.96	1.26	.08	.00	− .03	.70	3.95	1.31
24	.....	.....	4.72	3.94	3.37	1.12	0	.14	− .02	.88	3.43	1.38
25	.....	.....	4.30	4.53	3.58	1.06	0	.08	+ .04	.92	3.00	1.39
26	.....	.....	3.82	5.08	3.48	1.04	.01	.00	− .02	1.02	2.66	1.35
27	.....	.....	3.58	5.30	3.18	1.08	.08	.00	− .12	1.03	2.52	1.37
28	.....	1.64	3.34	4.72	2.93	1.05	.11	.00	− .14	1.03	2.29	1.37
29	.....	.....	3.18	4.00	2.66	.91	.12	.00	.....	1.03	2.18	1.35
30	1.68	.....	3.00	3.62	2.60	.91	.....	.00	.....	1.00	2.14	1.32
31	1.87	.....	2.89	.....	2.62	.....	.00	.00	.....	.99	.....	1.30

NOTE.—Ice jam reported Jan. 6 and shore and floating ice Feb. 1 to 25. Gage readings probably not materially affected thereby.

Daily discharge, in second-feet, of Yakima River near Wapato, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,020	4,330	4,350	8,950	10,500	8,390	1,690	190	82	34	1,850	5,620
2	2,850	3,920	12,100	8,880	9,280	8,740	1,540	216	34	26	2,050	5,170
3	2,560	3,410	17,000	8,390	8,780	7,480	1,540	196	26	102	2,150	4,780
4	2,450	3,230	15,700	7,480	8,950	6,700	1,510	212	18	1,370	2,180	4,520
5	2,300	3,270	12,500	7,550	9,170	5,850	1,510	247	10	1,740	2,220	4,420
6	2,420	3,310	9,380	7,480	9,100	6,120	1,320	158	10	2,190	2,090	4,420
7	2,720	3,180	8,320	7,590	10,400	5,820	1,290	183	10	2,560	2,280	4,380
8	2,800	3,130	7,900	7,590	12,000	5,410	1,330	206	10	2,950	2,680	4,420
9	2,750	3,070	7,940	7,620	14,100	4,910	1,470	255	10	3,060	3,890	4,220
10	2,660	2,990	7,620	7,580	15,200	4,730	1,360	267	10	3,140	4,380	4,200
11	2,520	2,920	8,560	7,970	19,000	5,300	1,470	226	10	2,890	8,220	4,180
12	2,280	2,900	9,020	9,060	19,500	6,520	1,420	247	10	2,310	6,850	3,900
13	2,180	2,850	10,400	9,670	17,400	6,030	1,340	820	10	2,450	6,520	3,610
14	2,050	2,820	12,100	9,530	14,600	5,330	1,210	812	10	2,190	6,200	3,090
15	1,970	2,720	13,400	8,840	12,000	5,020	1,120	728	10	1,950	5,040	3,230
16	1,930	2,540	14,800	8,320	10,200	4,890	998	332	10	2,130	2,820	3,160
17	1,950	2,450	15,800	8,390	9,280	4,330	804	230	52	2,020	4,200	3,070
18	2,050	2,450	17,000	8,740	8,950	3,960	706	206	52	2,060	4,100	2,920
19	2,210	2,480	18,800	10,500	9,380	3,500	643	230	49	1,470	3,810	2,520
20	2,230	2,450	24,100	13,900	9,240	3,630	551	212	41	1,800	3,900	2,500
21	2,260	2,420	28,300	15,600	8,880	3,320	455	255	26	1,680	7,080	2,450
22	2,280	2,210	26,800	14,700	8,460	2,990	383	244	86	1,220	14,500	2,390
23	4,760	2,180	24,600	14,700	8,990	2,720	337	247	114	980	15,700	2,450
24	6,140	2,230	20,900	15,600	10,500	2,630	299	413	98	1,480	13,200	2,570
25	6,010	2,320	17,000	19,300	12,000	2,260	290	350	166	1,620	9,890	2,600
26	5,590	2,480	14,200	23,200	11,600	2,260	373	212	124	1,800	8,220	2,520
27	4,990	3,560	12,800	23,900	10,100	2,260	346	100	58	1,820	7,250	2,480
28	4,840	4,180	11,600	19,900	9,060	2,230	373	116	36	1,850	6,080	2,480
29	4,380	.....	10,300	15,200	7,940	1,930	342	126	10	1,860	4,910	2,450
30	4,290	.....	9,530	12,800	7,860	1,950	212	124	10	1,800	5,590	2,420
31	4,860	.....	9,200	.....	7,720	.....	152	102	.....	1,730	.....	2,380

NOTE.—Daily discharge determined from a well-defined rating curve. Discharge Nov. 28 interpolated.

Monthly discharge of Yakima River near Wapato, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	6,140	1,930	3,170	195,000	A.
February	4,330	2,180	2,930	163,000	A.
March	28,300	4,350	13,900	855,000	A.
April	23,900	7,480	11,600	690,000	A.
May	19,500	7,720	11,000	676,000	A.
June	8,740	1,930	4,570	272,000	A.
July	1,690	152	916	56,300	A.
August	820	100	273	16,800	A.
September	166	10	401	2,390	B.
October	3,140	26	1,820	112,000	A.
November	15,700	1,850	5,660	337,000	A.
December	5,620	2,380	3,400	209,000	A.
The year	28,300	10	4,950	3,590,000	

YAKIMA RIVER AT KIONA, WASH.

This station, which is located in T. 9 N., R. 27 E., at the highway bridge about 1,800 feet northwest of the Northern Pacific Railway station, was established August 20, 1895. No tributaries enter in the vicinity of this station.

Much water is diverted from the river, both below and above the station. At the medium and high stages the total amount of diverted water is but a small per cent of the flow of the river, but at low stages this condition is reversed, and the water passing Kiona consists in large part of return water from irrigation. The data obtained here are, however, of value as indicating the flow at Prosser, which, on account of certain water rights, becomes of considerable importance. Between Prosser and Kiona, a distance of 14 miles, the only diversion of consequence is the Kiona canal, and the only inflow is the waste waters from Sunnyside canal.

The flow at the gaging station is controlled by a riffle about 1,000 feet below the bridge, and this control has made the development of a permanent rating curve possible. A chain gage now used was installed May 8, 1906, on the bridge from which discharge measurements are made, to replace the old wire gage and staff gages formerly used. All gage heights have been corrected to a uniform datum. During the winter months a small amount of ice is apt to form in the vicinity of the station, but only in exceptional seasons does this ice interfere with the determination of the flow.

Discharge measurements of Yakima River at Kiona, Wash., for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 16	McGlashan and Kimble	330	2,700	10.91	15,700
June 27	H. D. McGlashan	220	1,110	5.42	2,370
Aug. 1	H. Kimble	209	602	3.27	410
16	F. B. Storey	210	751	3.76	803
Sept. 6	do	208	611	3.02	356
16	do	209	613	3.10	390
Oct. 4	do	209	631	3.24	395

Daily gage height, in feet, of Yakima River at Kiona, Wash., for 1910.

[Mrs. J. H. Kennedy, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.81	7.66	7.05	9.53	10.58	8.49	5.12	3.24	3.12	3.26	5.30	7.40
2	6.23	7.26	9.05	9.45	9.98	8.87	5.04	3.06	3.20	3.18	5.30	7.30
3	6.17	6.98	10.85	9.49	9.34	8.57	4.90	3.06	3.20	3.20	5.30	7.20
4	5.77	6.72	11.65	9.23	9.20	8.41	4.80	3.10	3.20	3.24	5.30	7.22
5	5.71	6.66	11.45	9.09	9.30	8.03	4.70	3.02	3.14	3.90	5.40	7.24
6	5.49	6.64	10.91	8.95	9.34	7.99	4.70	2.98	3.08	4.94	5.40	7.06
7	5.59	6.62	9.97	8.99	9.28	7.87	4.66	3.02	3.00	5.40	5.40	7.00
8	5.59	6.38	9.51	8.99	9.92	7.67	4.62	2.98	2.86	5.62	5.50	6.86
9	5.97	6.38	9.21	8.99	10.50	7.53	4.62	2.30	2.82	5.90	5.60	6.82
10	5.89	6.32	9.15	8.99	11.08	7.27	4.72	3.10	2.76	5.96	6.50	6.76
11	5.82	6.26	9.15	8.99	11.48	7.15	4.62	3.12	3.18	6.00	6.90	6.52
12	5.67	6.26	9.37	9.09	12.04	7.27	4.60	3.14	3.08	5.94	8.36	6.54
13	5.82	6.16	9.71	9.53	12.04	8.01	4.60	3.08	3.16	5.58	7.94	6.46
14	5.67	6.26	10.05	9.69	11.54	7.77	4.56	3.14	3.16	5.50	7.76	6.36
15	5.93	6.16	10.59	9.45	10.88	7.47	4.52	3.26	3.22	5.40	7.56	6.32
16	5.62	6.12	10.90	9.19	10.28	7.17	4.48	3.80	3.16	5.30	7.02	6.30
17	5.57	6.06	11.24	9.15	9.64	7.03	4.30	3.66	2.94	5.30	6.86	6.22
18	5.62	5.96	11.74	9.19	9.20	6.81	4.20	3.34	3.08	5.40	6.68	6.00
19	6.01	5.96	12.04	9.39	9.28	6.49	4.08	3.26	3.06	5.40	6.66	5.96
20	5.81	5.88	12.30	9.99	9.28	6.33	3.22	3.30	3.10	4.94	6.44	5.84
21	5.88	5.92	13.23	10.79	9.28	6.41	3.30	3.00	3.16	5.12	6.50	5.80
22	6.13	6.00	14.20	11.19	9.08	6.19	3.60	3.04	3.20	5.12	8.52	5.76
23	6.99	6.62	14.53	11.09	8.96	6.01	3.70	3.22	3.16	4.90	10.34	5.72
24	8.47	6.12	14.14	11.03	9.34	5.83	3.60	3.12	3.20	5.10	10.32	5.70
25	8.77	6.26	13.22	11.39	9.84	5.69	3.52	2.96	3.16	5.12	9.76	5.80
26	8.47	6.30	12.34	11.99	10.08	5.55	3.48	3.00	3.24	5.12	9.00	5.90
27	7.99	6.48	11.66	12.69	9.82	5.41	3.42	3.04	3.36	5.20	8.56	5.86
28	7.99	6.86	10.90	13.09	9.48	5.44	3.38	3.22	3.40	5.36	8.12	5.90
29	7.67	.....	10.56	12.59	9.06	5.34	3.38	3.20	3.40	5.40	7.70	5.86
30	7.47	.....	10.10	11.49	8.70	5.18	3.32	3.18	3.22	5.40	7.56	5.86
31	7.47	.....	9.80	.....	8.60	.....	3.28	3.16	.....	5.30	.....	5.78

NOTE.—Narrow strips of shore ice reported during January and February: gage heights probably not materially affected thereby.

Daily discharge, in second-feet, of Yakima River at Kiona, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,830	6,120	4,900	10,400	13,200	7,900	1,920	391	400	401	2,140	5,600
2	3,460	5,320	9,220	10,200	11,600	8,780	1,830	311	440	363	2,140	5,400
3	3,360	4,760	14,000	10,300	9,950	8,080	1,680	311	440	372	2,140	5,200
4	2,780	4,290	16,800	9,680	9,600	7,710	1,580	328	440	391	2,140	5,240
5	2,690	4,190	16,100	9,320	9,850	6,860	1,480	394	410	810	2,270	5,280
6	2,390	4,160	14,200	8,980	9,950	6,780	1,480	278	381	1,720	2,270	4,920
7	2,530	4,120	11,500	9,080	9,800	6,540	1,440	294	345	2,270	2,270	4,800
8	2,530	3,720	10,400	9,080	11,400	6,140	1,400	278	285	2,570	2,400	4,540
9	3,060	3,720	9,620	9,080	13,000	5,860	1,400	110	270	2,960	2,540	4,470
10	2,950	3,610	9,480	9,080	14,800	5,340	1,500	390	251	3,040	3,920	4,360
11	2,850	3,510	9,480	9,080	16,200	5,100	1,400	400	430	3,100	4,610	3,950
12	2,640	3,510	10,000	9,320	18,100	5,340	1,380	410	381	3,020	7,600	3,990
13	2,850	3,350	10,900	10,400	18,100	6,820	1,380	381	420	2,510	6,680	3,850
14	2,640	3,510	11,700	10,800	16,400	6,340	1,340	410	420	2,400	6,320	3,680
15	3,000	3,350	13,300	10,200	14,100	5,740	1,310	476	452	2,270	5,920	3,610
16	2,570	3,280	14,200	9,580	12,400	5,140	1,270	840	420	2,140	4,840	3,580
17	2,500	3,190	15,300	9,480	10,700	4,860	1,120	742	318	2,140	4,540	3,440
18	2,570	3,040	17,100	9,580	9,600	4,450	1,040	524	381	2,270	4,230	3,100
19	3,120	3,040	18,100	10,100	9,800	3,900	944	476	372	2,270	4,190	3,040
20	2,830	2,930	19,100	11,600	9,800	3,630	382	500	390	1,720	3,820	2,880
21	2,930	2,990	22,900	13,900	9,800	3,770	420	345	420	1,920	3,920	2,820
22	3,300	3,100	27,500	15,200	9,300	3,390	600	363	440	1,920	7,970	2,760
23	4,786	4,120	29,200	14,800	9,000	3,120	670	452	420	1,680	12,500	2,710
24	7,850	3,280	27,200	14,600	9,950	2,860	600	400	440	1,900	12,500	2,680
25	8,540	3,510	22,800	15,900	11,200	2,670	552	327	420	1,920	11,000	2,820
26	7,850	3,580	19,300	18,000	11,800	2,470	528	345	391	1,920	9,100	2,960
27	6,780	3,890	16,800	20,700	11,200	2,280	492	363	456	2,020	8,060	2,900
28	6,780	4,340	14,200	22,300	10,300	2,320	468	452	480	2,220	7,050	2,960
29	6,140	.....	13,200	20,300	9,250	2,190	468	440	480	2,270	6,200	2,900
30	5,740	.....	11,900	16,200	8,380	2,000	432	430	382	2,270	5,920	2,900
31	5,740	.....	11,100	.....	8,150	.....	410	420	.....	2,140	.....	2,790

NOTE.—Daily discharge Jan. 1 to Aug. 9 and Sept. 26 to Dec. 31 determined from a well-defined rating curve prepared from practically all the discharge measurements made at the station. Three measurements made in August and September indicate a different rating, which has been used Aug. 10 to Sept. 25, and is fairly well defined.

Monthly discharge of Yakima River at Kiona, Wash., for 1910.

[Drainage area, 5,230 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
Jan	8,540	2,500	3,950	0.755	0.87	243,000	B.
February	6,120	2,930	3,780	.723	.75	210,000	B.
March	29,200	4,900	15,200	2.91	3.36	935,000	A.
April	22,300	8,980	12,200	2.33	2.60	726,000	A.
May	18,100	8,150	11,500	2.20	2.54	707,000	A.
June	8,780	2,000	4,950	.946	1.05	295,000	A.
July	1,920	410	1,060	.203	.23	65,200	A.
August	840	110	406	.078	.09	25,000	B.
September	480	251	399	.076	.08	23,700	B.
October	3,100	363	1,970	.377	.43	121,000	A.
November	12,500	2,140	5,370	1.03	1.15	320,000	A.
December	5,600	2,680	3,750	.717	.83	231,000	A.
The year	29,200	110	5,390	1.03	13.99	3,900,000	

YAKIMA RIVER NEAR RICHLAND, WASH.

This station, which is located below all diversions, is maintained during the later part of irrigating seasons only to determine the amount of water flowing from the Yakima into Columbia River during the low-water period.

The station was originally established at Richland Ferry, Wash., 8 miles above Kennewick and 2½ miles above the mouth of the river. It was moved during 1908 to a highway bridge in sec. 24, T. 9 N., R. 28 E., on the road from Richland to Kennewick, half a mile above the mouth of the river, where conditions were more favorable.

The gage used in 1906 was 500 feet below the ferry. On August 13, 1907, a staff gage was installed on an old bridge pier at the ferry. Since this time a new staff gage has been installed each year at an arbitrary datum, and each gage has been rated separately. A fair rating curve has been made for the gage used during 1910, and the records may be considered good.

Discharge measurements at the ferry site were made by wading. Measurements at the bridge site are made either from the bridge or by wading. The bed of the stream is of gravel and cobblestones and the flow is controlled by a riffle 200 feet below the gage.

Discharge measurements of Yakima River near Richland, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 2[a]	H. Kimble	137	134	2.06	87.8
15[a]	Bolster and Storey	215	126	2.08	121
Sept. 6[a]	F. B. Storey	85	63.9	2.15	115
Oct. 21	do	291	1,340	3.96	2,050

[a] Measured by wading.

Daily gage height, in feet, and discharge, in second-feet, of Yakima River near Richland, Wash., for 1910.

[J. B. Clements, observer.]

Day.	Aug.		Sept.		Oct.		Nov.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	70	2.4	240	2.6	375	4.1	2,270
2	.....	70	2.2	140	2.5	300	4.0	2,120
3	2.0	70	2.2	140	2.4	240	4.0	2,120
4	2.0	70	2.2	140	2.6	375	4.1	2,270
5	2.0	70	2.2	140	2.4	240	4.1	2,270
6	1.9	48	2.1	100	2.7	460	.....	.....
7	1.9	48	2.0	70	3.5	1,400	.....	.....
8	1.9	48	2.0	70	3.6	1,540	.....	.....
9	1.9	48	1.9	48	4.0	2,120	.....	.....
10	1.8	33	1.9	48	4.5	2,900	.....	.....
11	1.8	33	2.0	70	4.3	2,580	.....	.....
12	1.9	48	2.1	100	4.4	2,740	.....	.....
13	2.0	70	2.1	100	4.3	2,580	.....	.....
14	2.0	70	2.2	140	4.1	2,270	.....	.....
15	2.1	100	1.9	48	4.0	2,120	.....	.....
16	2.6	375	1.8	33	4.0	2,120	.....	.....
17	2.7	460	2.2	140	3.9	1,970	.....	.....
18	2.6	375	2.2	140	4.0	2,120	.....	.....
19	2.4	240	2.1	100	4.1	2,270	.....	.....
20	2.2	140	2.2	140	4.0	2,120	.....	.....
21	2.2	140	2.3	185	3.9	1,970	.....	.....
22	2.1	100	2.4	240	4.1	2,270	.....	.....
23	2.2	140	2.3	185	3.8	1,820	.....	.....
24	2.2	140	2.7	460	3.7	1,680	.....	.....
25	1.9	48	2.6	375	3.8	1,820	.....	.....
26	2.0	70	2.5	300	3.9	1,970	.....	.....
27	2.0	70	2.6	375	4.0	2,120	.....	.....
28	2.2	140	2.4	240	4.0	2,120	.....	.....
29	2.3	185	2.5	300	4.1	2,270	.....	.....
30	2.3	185	2.7	460	4.1	2,270	.....	.....
31	2.2	140	.....	.....	4.1	2,270	.....	.....

NOTE.—Daily discharges determined from a fairly well-defined rating curve.

Monthly discharge of Yakima River near Richland, Wash., for 1910.

[Drainage area, 5,270 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
August	460	33	124	0.024	0.03	7,620	B.
September	460	33	176	.033	.04	10,500	B.
October	2,900	240	1,790	.339	.39	110,000	C.

CABIN CREEK NEAR EASTON, WASH.

This station, which is located in sec. 9, T. 20 N., R. 13 E., at the Northern Pacific Railway bridge one-half mile above the mouth of the stream and 2¾ miles west of Easton, Wash., was established May 12, 1909.

The gage is a vertical staff fixed to a piling on the right bank underneath the railroad bridge. There has been no change in gage datum.

Measurements are made from the bridge or by wading at low stages. There is an east channel whose waters do not pass the gage, but this is measured and included in the discharge. The east channel is carried under the railroad embankment in a 42-inch iron pipe. The water is confined at all stages by the railroad embankment.

The bed of the stream is of gravel and subject to change during high stages. From a tributary of Cabin Creek above the station a 6-inch wooden pipe diverts water for use in locomotives at Easton.

The gage-height record is not very good, but a good rating curve has been secured, and the records as a whole may be considered fair.

Discharge measurements of Cabin Creek near Easton, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 12	H. D. McGlashan	34	64.2	2.55	213
28	do	38	113	2.97	534
June 21	do	35	64.8	1.73	77.1
July 12[a]	McGlashan and Storey	21.5	23	1.38	19.3
25[a]	do	21.5	17	1.27	14.6
Aug. 18[a]	H. D. McGlashan	23	15.2	1.14	10.8
30[a]	do	21	12.2	1.12	7.0
Sept. 15[a]	do	20.5	11.5	1.10	5.3
Nov. 10	F. B. Storey	37	51.5	2.12	97

[a] Measured by wading.

Daily gage height, in feet, of Cabin Creek near Easton, Wash., for 1910.

[Chris Atkinson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.6	1.9	1.8	2.4	2.6	2.2	1.4	1.2	1.1	2.0	1.6	2.5
2	1.6	2.0	1.8	2.3	2.7	2.2	1.4	1.2	1.1	2.1	1.6	2.4
3	1.5	1.8	1.8	2.3	2.9	2.1	1.3	1.2	1.1	2.15	1.7	2.3
4	1.4	1.4	1.8	2.3	2.9	2.1	1.3	1.2	1.1	2.1	1.7	2.2
5	1.3	1.3	1.8	2.3	3.0	2.1	1.3	1.2	1.1	2.0	1.8	2.1
6	1.3	1.2	2.0	2.35	3.0	2.1	1.3	1.2	1.1	1.8	1.9	2.0
7	1.2	1.1	3.0	2.35	3.0	2.0	1.3	1.2	1.1	1.75	1.9	2.0
8	1.2	1.1	3.0	2.4	3.3	2.0	1.3	1.2	1.1	1.6	2.0	1.9
9	1.2	1.1	3.0	2.4	3.45	2.1	1.3	1.2	1.1	1.6	2.0	1.8
10	1.2	1.1	3.0	2.4	3.6	2.1	1.3	1.2	1.1	1.6	2.1	1.8
11	1.2	1.1	3.0	2.4	3.5	2.1	1.3	1.15	1.1	1.6	2.3	1.8
12	1.2	1.05	3.0	2.55	3.4	2.1	1.3	1.15	1.1	1.5	2.4	1.9
13	1.2	1.05	3.0	2.6	3.0	2.05	1.3	1.15	1.1	1.5	2.4	1.9
14	1.2	1.05	3.0	2.6	2.35	2.0	1.3	1.15	1.1	1.5	2.5	1.8
15	1.2	1.05	3.2	2.6	2.3	2.0	1.3	1.15	1.1	1.5	2.6	1.8
16	1.15	1.05	3.2	2.55	2.2	1.9	1.3	1.15	1.1	1.55	2.6	1.7
17	1.15	1.0	3.5	2.55	2.2	1.8	1.3	1.15	1.1	1.55	2.6	1.7
18	1.2	1.0	3.7	2.55	2.1	1.8	1.3	1.15	1.05	1.5	2.5	1.7
19	1.2	1.0	3.8	3.1	2.1	1.8	1.3	1.15	1.05	1.5	2.5	1.7
20	1.2	1.0	3.8	3.5	2.1	1.7	1.3	1.15	1.05	1.5	2.5	1.8
21	2.0	1.0	3.8	3.4	2.1	1.6	1.3	1.15	1.05	1.5	2.7	1.8
22	2.05	1.0	3.6	3.1	2.1	1.6	1.3	1.15	1.05	1.5	2.7	1.9
23	2.1	1.0	3.5	3.2	2.0	1.6	1.25	1.15	1.05	1.5	3.2	1.9
24	2.05	1.9	3.4	3.4	2.0	1.55	1.25	1.15	1.05	1.5	3.2	1.8
25	2.0	1.9	3.1	3.55	2.0	1.55	1.25	1.15	1.05	1.7	3.2	1.8
26	2.0	1.8	3.05	3.55	2.0	1.5	1.25	1.15	1.05	1.65	3.2	1.8
27	2.0	1.8	3.05	3.3	2.0	1.5	1.25	1.15	1.05	1.55	3.1	1.7
28	2.0	1.8	3.0	3.0	2.0	1.5	1.25	1.15	1.15	1.5	2.8	1.6
29	2.1	.....	2.8	2.6	2.1	1.5	1.25	1.15	1.2	1.5	2.7	1.6
30	2.1	.....	2.3	2.5	2.2	1.5	1.2	1.15	1.5	1.55	2.7	1.5
31	2.1	.....	2.4	.....	2.3	.....	1.2	1.15	.....	1.55	.....	1.5

NOTE.—The low-water gage heights are somewhat uncertain on account of the question as to the observer's method of reporting them.

Daily discharge, in second-feet, of Cabin Creek near Easton, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	36	65	54	159	237	110	22	10	5	78	36	193
2	36	78	54	133	295	110	22	10	5	93	36	159
3	28	54	54	133	464	93	16	10	5	102	44	133
4	22	22	54	133	464	93	16	10	5	93	44	110
5	16	16	54	133	566	93	16	10	5	78	54	93
6	16	10	78	146	566	93	16	10	5	54	65	78
7	10	5	566	146	566	78	16	10	5	49	65	78
8	10	5	566	159	872	78	16	10	5	36	78	65
9	10	5	566	159	1,020	93	16	10	5	36	78	54
10	10	5	566	159	1,180	93	16	10	5	36	93	54
11	10	5	566	159	1,080	93	16	8	5	36	133	54
12	10	4	566	214	974	93	16	8	5	28	159	65
13	10	4	566	237	566	86	16	8	5	28	159	65
14	10	4	566	237	146	78	16	8	5	28	193	54
15	10	4	770	237	133	78	16	8	5	28	237	54
16	8	4	770	214	110	65	16	8	5	32	237	44
17	8	2	1,080	214	110	54	16	8	5	32	237	44
18	10	2	1,280	214	93	54	16	8	4	28	193	44
19	10	2	1,380	668	93	54	16	8	4	28	193	44
20	10	2	1,380	1,080	93	44	16	8	4	28	193	54
21	78	2	1,380	974	93	36	16	8	4	28	295	54
22	86	2	1,180	668	93	36	16	8	4	28	295	65
23	93	2	1,080	770	78	36	13	8	4	28	770	65
24	86	65	974	974	78	32	13	8	4	28	770	54
25	78	65	668	1,120	78	32	13	8	4	44	770	54
26	78	54	617	1,120	78	28	13	8	4	40	770	54
27	78	54	617	872	78	28	13	8	4	32	668	44
28	78	54	566	566	78	28	13	8	8	28	369	36
29	93	.....	369	237	93	28	13	8	10	28	295	36
30	93	.....	133	193	110	28	10	8	28	32	295	28
31	93	.....	159	.....	133	.....	10	8	.....	32	.....	28

NOTE.—Daily discharge determined from a fairly well-defined rating curve.

Monthly discharge of Cabin Creek near Easton, Wash., for 1910.

[Drainage area, 32 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	93	8	39.5	1.23	1.42	2,430	C.
February	78	2	21.3	.666	.69	1,180	C.
March	1,380	54	622	19.4	22.37	38,200	C.
April	1,120	133	414	12.9	14.39	24,600	C.
May	1,180	78	343	10.7	12.34	21,100	C.
June	110	28	64.8	2.02	2.25	3,860	C.
July	22	10	15.3	.478	.55	941	C.
August	10	8	8.6	.269	.31	529	C.
September	28	5	5.7	.178	.20	339	C.
October	102	28	41.9	1.31	1.51	2,580	C.
November	770	36	261	8.16	9.10	15,500	C.
December	193	28	66.4	2.08	2.40	4,080	C.
The year	1,380	2	159	5.00	67.53	115,000	

KACHESS LAKE NEAR EASTON, WASH.

Kachess Lake is divided into two parts, known as Kachess and Little Kachess, which are connected by a short channel called The Narrows. The elevation of the water surface is 2,230 feet and the superficial area at the medium stage is 3,600 acres.

A gage was established in Kachess Lake September 20, 1905, about 300 feet above the dam at the outlet. The gage datum in this lake is at an elevation of 2,227.02 feet, and has not been changed since the gage was installed.

Daily gage height, in feet, of Kachess Lake near Easton, Wash., for 1910.

[H. A. Shandy, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.58	1.60	1.60	2.65	3.90	3.30	4.04	4.14	0.48	0.48	1.61	2.76
2	1.55	1.55	1.66	2.70	3.75	3.20	4.11	3.98	.46	.58	1.57	2.60
3	1.53	1.53	1.80	2.60	3.62	3.08	4.20	3.78	.42	1.08	1.60	2.42
4	1.50	1.50	1.95	2.52	3.50	2.98	4.30	3.59	.39	1.58	1.50	2.32
5	1.45	1.46	2.00	2.48	3.43	2.90	4.38	3.36	.37	1.77	1.47	2.22
6	1.40	1.42	2.01	2.38	3.45	2.85	4.44	3.14	.34	1.98	1.48	2.13
7	1.35	1.38	2.00	2.37	3.50	2.77	4.50	2.89	.31	2.37	1.56	2.07
8	1.30	1.34	1.96	2.38	3.78	2.69	4.59	2.60	.24	2.59	1.82	1.98
9	1.28	1.31	1.90	2.32	3.81	2.60	4.68	2.38	.23	2.60	1.95	1.90
10	1.26	1.28	1.85	2.28	4.05	2.55	4.74	2.20	.23	2.60	2.09	1.86
11	1.21	1.26	1.80	2.29	4.38	2.60	4.82	2.00	.20	2.69	2.45	1.72
12	1.16	1.20	1.78	2.30	4.51	2.58	4.89	1.90	.20	2.69	2.63	1.67
13	1.11	1.22	1.79	2.35	4.48	2.52	4.93	1.80	.16	2.58	2.63	1.60
14	1.08	1.24	1.82	2.39	4.40	2.49	4.98	1.70	.15	2.57	2.60	1.52
15	1.04	1.29	1.89	2.37	4.20	2.42	5.02	1.59	.15	2.50	2.62	1.48
16	1.00	1.22	1.95	2.38	4.06	2.39	5.05	1.48	.16	2.45	2.70	1.44
17	.97	1.19	2.20	2.35	3.93	2.40	5.10	1.37	.20	2.45	2.69	1.40
18	1.08	1.18	2.41	2.38	3.88	2.50	5.14	1.26	.21	2.42	2.70	1.33
19	1.10	1.15	2.58	2.49	3.83	2.69	5.17	1.16	.22	2.40	2.70	1.26
20	1.06	1.14	2.85	2.80	3.71	2.81	5.20	1.07	.24	2.35	2.83	1.24
21	1.03	1.18	3.15	2.98	3.70	2.98	5.21	1.03	.27	2.23	3.70	1.20
22	1.07	1.12	3.32	3.20	3.60	3.10	5.24	.98	.30	2.10	4.31	1.17
23	1.16	1.16	3.47	3.28	3.61	3.20	5.20	.90	.32	1.97	4.37	1.20
24	1.25	1.20	3.49	3.48	3.65	3.30	5.12	.81	.32	1.95	4.17	1.30
25	1.36	1.24	3.41	3.80	3.75	3.40	5.00	.75	.32	2.00	3.95	1.28
26	1.38	1.28	3.31	4.10	3.75	3.57	4.90	.68	.32	2.01	3.71	1.28
27	1.46	1.30	3.19	4.45	3.61	3.68	4.80	.64	.34	1.99	3.47	1.27
28	1.50	1.41	3.05	4.42	3.50	3.79	4.69	.59	.36	1.95	3.24	1.23
29	1.50	.....	2.98	4.30	3.40	3.85	4.58	.56	.40	1.88	3.03	1.25
30	1.51	.....	2.86	4.10	3.38	3.95	4.47	.51	.39	1.75	2.91	1.30
31	1.55	.....	2.75	.....	3.25	.....	4.31	.49	.....	1.69	.....	1.28

Volume of storage on Kachess Lake near Easton, Wash., for 1909–10.

Gage height.	Storage.	Gage height.	Storage.	Gage. height.	Storage.
Feet.	*Acre-feet.*	*Feet.*	*Acre-feet.*	*Feet.*	*Acre-feet.*
0.00	0	3.00	10,500	6.00	21,100
1.00	3,500	4.00	14,000	7.00	24,700
2.00	7,000	5.00	17,500	8.00	28,400

NOTE.—This table has been used in determining the amount of water stored in or drawn from the lake, and, in connection with the records on Kachess River, to compute the inflow into the lake. This table differs slightly from that published in Water-Supply Paper 252. It is, however, the same as used by the United States Reclamation Service.

KACHESS RIVER NEAR EASTON, WASH.

This station, which is located in sec. 3, T. 20 N., R. 13 E., half a mile below the outlet of Kachess Lake and 2 miles northwest of Easton, was established October 14, 1903. The river receives no important tributaries.

The records determine the amount of water available for storage in Kachess Lake, which forms one of the principal reservoirs under consideration by the United States Reclamation Service.

The flow is under artificial control, the lake being used for storage by the Cascade Canal Co. prior to its acquisition by the United States Reclamation Service.

The channel is open throughout the year at this point. The current is swift and ice does not form.

The datum of the inclined staff gage, which is 2,178.41 feet above sea level, has not been altered since it was established. Discharge measurements are made from a cable at the gage or by wading.

A good rating curve has been constructed and the records may be considered excellent.

Discharge measurements of Kachess River near Easton, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 12	H. D. McGlashan	73	157	4.67	431
27	do	79	286	6.45	1,060
May 31	do	73	207	5.42	648
June 20	do	55	35.1	2.94	22
July 11[a]	McGlashan and Storey	21.5	19.3	2.77	10.3
24	do	71	104	4.04	244
Aug. 18[a]	H. D. McGlashan	71	116	3.83	195
30[a]	do	68	75.5	3.38	82.3
Sept. 15[a]	do	14.5	6.9	2.55	3.8

[a] Measured by wading.

Daily gage height, in feet, of Kachess River near Easton, Wash., for 1910.

[H. A. Shandy, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.07	4.10	4.20	5.00	6.02	5.52	2.75	4.40	3.32	2.60	4.10	5.03
2	4.05	4.04	4.28	4.96	5.80	5.42	2.74	4.40	3.30	2.60	4.05	4.90
3	4.02	4.02	4.45	4.92	5.77	5.30	2.73	4.70	3.28	2.75	4.08	4.78
4	3.98	4.00	4.49	4.94	5.70	5.21	2.73	4.73	3.28	2.77	4.02	4.70
5	3.94	3.98	4.52	4.91	5.62	5.12	2.72	4.70	3.28	2.81	4.00	4.60
6	3.88	3.96	4.52	4.83	5.64	5.09	2.73	4.71	3.27	3.20	4.00	4.52
7	3.84	3.93	4.52	4.73	5.68	5.02	2.73	5.17	3.26	2.85	4.09	4.47
8	3.80	3.90	4.48	4.74	5.82	4.97	2.74	4.90	3.24	2.60	4.25	4.39
9	3.79	3.87	4.40	4.71	5.95	4.88	2.74	4.78	3.22	4.30	4.39	4.35
10	3.77	3.85	4.35	4.68	6.17	4.81	2.75	4.50	3.22	3.80	4.55	4.30
11	3.74	3.84	4.30	4.68	6.37	4.88	2.75	4.32	3.22	2.80	4.85	4.20
12	3.69	3.80	4.29	4.68	6.43	4.86	2.76	3.88	3.22	4.30	4.98	4.12
13	3.66	3.82	4.29	4.71	6.37	4.80	2.76	3.89	3.18	3.20	4.98	4.08
14	3.64	3.82	4.30	4.73	6.28	4.77	2.75	3.88	3.16	3.00	3.15	4.05
15	3.62	3.85	4.42	4.72	6.20	4.70	2.75	3.91	2.55	4.30	3.20	4.00
16	3.60	3.82	4.48	4.73	6.09	4.18	2.75	3.88	2.55	4.50	3.19	3.95
17	3.58	3.80	4.65	4.70	6.00	3.40	2.75	3.84	2.55	4.55	2.98	3.95
18	3.70	3.80	4.79	4.73	5.97	2.90	2.75	3.77	2.55	4.50	3.40	3.90
19	3.71	3.78	4.95	4.81	5.94	2.92	2.74	3.70	2.55	3.38	3.14	3.86
20	3.68	3.78	5.20	5.10	5.84	2.90	2.74	3.66	2.55	4.28	5.00	3.84
21	3.67	3.80	5.45	5.33	5.80	2.92	2.74	3.63	2.56	4.30	6.08	3.80
22	3.69	3.78	5.54	5.45	5.70	2.89	2.76	3.61	2.55	4.50	6.45	3.78
23	3.72	3.80	5.73	5.55	5.72	2.90	4.00	3.58	2.55	4.40	6.54	3.80
24	3.80	3.82	5.75	5.70	5.74	2.89	4.00	3.54	2.55	4.30	6.32	3.81
25	3.90	3.85	5.69	5.97	5.83	2.87	3.99	3.50	2.55	4.00	6.12	3.80
26	3.91	3.87	5.59	6.35	5.83	2.86	4.02	3.48	2.55	4.00	5.90	3.80
27	3.98	3.89	5.50	6.45	5.72	2.86	4.01	3.45	2.55	4.02	5.70	3.79
28	4.00	3.98	5.40	6.40	5.65	2.80	4.00	3.41	2.55	3.90	5.58	3.78
29	4.00	.....	5.30	6.28	5.54	2.80	4.02	3.39	2.60	3.85	5.38	3.80
30	4.00	.....	5.20	6.15	5.48	2.75	4.00	3.38	2.58	4.20	5.25	3.85
31	4.05	.....	5.10	.....	5.45	.....	4.40	3.35	.....	4.15	.....	3.84

Daily discharge, in second-feet, of Kachess River near Easton, Wash., for 1910.

Day.	Jan	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	258	266	294	540	908	723	10	350	74	5	266	550
2	252	249	316	526	824	687	10	350	70	5	252	506
3	244	244	365	513	813	644	9	442	67	10	260	468
4	233	238	377	520	788	612	9	452	67	11	244	442
5	222	233	386	509	759	581	9	442	67	13	238	410
6	207	228	386	484	766	571	9	445	65	53	238	386
7	196	220	386	452	781	547	9	598	63	15	263	371
8	186	212	374	455	832	530	10	506	60	5	308	347
9	183	204	350	445	881	500	10	468	56	322	347	336
10	178	199	336	436	968	477	10	380	56	186	395	322
11	170	196	322	436	1,050	500	10	328	56	12	490	294
12	158	186	319	436	1,070	493	10	207	56	322	533	272
13	150	191	319	445	1,050	474	10	209	50	53	533	260
14	146	191	322	452	1,010	464	10	207	47	27	46	252
15	141	199	356	448	980	442	10	215	4	322	53	238
16	136	191	374	452	936	288	10	207	4	380	52	233
17	131	186	426	442	900	90	10	196	4	395	25	225
18	160	186	471	452	889	18	10	178	4	380	90	212
19	163	181	523	477	877	20	10	160	4	86	45	202
20	155	181	608	574	839	18	10	150	4	316	540	196
21	153	186	698	655	824	20	10	143	4	322	932	186
22	158	181	730	698	788	17	10	138	4	380	1,080	181
23	165	186	799	734	795	18	238	131	4	350	1,120	186
24	186	191	806	788	802	17	238	122	4	322	1,030	189
25	212	199	784	889	835	16	235	112	4	238	948	186
26	215	204	748	1,040	835	16	244	108	4	238	862	186
27	233	209	716	1,080	795	16	241	101	4	244	788	183
28	238	233	680	1,060	770	12	238	92	4	212	745	181
29	238	.....	644	1,010	730	12	244	88	5	199	673	186
30	238	.....	608	960	709	10	238	86	5	294	626	199
31	252	.....	574	.....	698	.....	350	80	.....	280	.....	196

NOTE.—Daily discharge determined from a well-defined rating curve derived from all measurements made at this station.

Monthly discharge of Kachess River near Easton, Wash., for 1910.

[Drainage area, 63 square miles.]

Month.	Discharge in (second-feet).			Run-off (total in acre-feet).			Discharge without storage (second-feet).		Run-off (depth in inches) on drainage area.	Accuracy.
	Max.	Min.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.		
January	258	131	192	11,800	− 105	11,700	191	3.03	3.49	A.
February	266	181	206	11,400	− 490	10,900	197	3.13	3.26	A.
March	806	294	497	30,600	+ 4,690	35,300	574	9.11	10.50	A.
April	1,080	436	614	36,500	+ 4,720	41,200	693	11.0	12.27	A.
May	1,070	698	855	52,600	− 2,980	49,600	807	12.8	14.76	A.
June	723	10	294	17,500	+ 2,450	20,000	336	5.33	5.94	A.
July	350	9	80.0	4,920	+ 1,260	6,180	100	1.59	1.83	A.
August	598	80	248	15,200	−13,400	1,800	29.3	.465	.54	A.
September	74	4	30.7	1,890	− 350	1,540	25.9	.411	.46	A.
October	395	5	193	11,900	+ 4,550	16,400	267	4.24	4.89	A.
November	1,120	25	467	27,800	+ 4,270	32,100	540	8.57	9.56	A.
December	550	181	277	17,000	− 5,700	11,300	184	2.92	3.37	A.
The year	1,120	4	330	239,000	− 1,080	238,000	329	5.22	70.87	

CLEALUM LAKE NEAR ROSLYN, WASH.

Observations of heights of Clealum Lake were begun January 25, 1906.

During the winter of 1907–8 a temporary crib dam was constructed 200 feet below the outlet of the lake. Between the outlet of the lake and the dam when the lake stage is below 6 feet the water surface falls somewhat, and this fall increases with decrease of stage. Gages located below the outlet, therefore, do not record the true lake level below 6 feet. Five gages have been used at this station as follows:

Gage No. 1 was used until March 31, 1906, when it was destroyed by waves. This gage was not referred to a bench mark and the recorded gage heights are not comparable with subsequent records.

Gage No. 2, installed May 4, 1906, is a reference point on a bowlder in the lake and is used for measuring to water surface. The zero of this gage is 2,122.3 feet above sea level, United States Geological Survey datum. This gage indicates the true height of the water surface of the lake and readings are available (with some omissions) in Water-Supply Paper 252, May 4, 1906, to November 9, 1907.

Gage No. 3, installed June 17, 1907, is attached to the abutment of the dam. It is not affected by wave action in this position. The zero of this gage is at the elevation of the top of the sill of the outlet tunnels in the dam and is 2,122.75 feet above sea level, United States Geological Survey datum, or 0.45 foot higher than the zero of gage No. 2. Readings on this gage prior to March 15, 1908, are not comparable with those from gage No. 2. The addition of 0.45 foot to readings on gage No. 3, subsequent to March 14, 1908, gives the same readings as gage No. 2 for stages above 6 feet. Readings are available on gages No. 3 (and No. 4) in Water-Supply Paper 252 (with some omissions) from June 18, 1907, to December 31, 1908.

Gage No. 4 is an auxiliary gage (in a stilling box to eliminate wave action and for greater refinement) installed at the dam November 8, 1907, at the same elevation as gages 3 and 5.

Gage No. 5, installed during 1909, at the same elevation as gages 3 and 4, is located above the outlet of the lake and hence gives true lake levels at all stages.

Beginning 1909 gage heights are read on gage No. 5 at low stages when the lake surface is drawn down sufficiently to develop an appreciable current between the lake and the dam, and on gages 3 or 4 at higher stages.

No change has been made in readings as recorded for 1909 and 1910 and hence there is a difference of 0.45 foot in readings for these years and those prior to 1909 which are read on or referred to gage No. 2.

Daily gage height, in feet of Clealum Lake near Roslyn, Wash., for 1910.

[A. D. Nichols, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.75	6.55	6.55	12.4	13.15	13.6	12.4	11.85	2.2	1.75	8.1	10.45
2	8.4	6.75	7.0	12.5	13.05	13.45	12.3	11.8	2.15	1.8	8.0	10.05
3	8.05	6.9	7.65	12.4	13.0	13.15	12.3	11.8	2.1	2.2	7.75	9.75
4	7.7	7.0	8.25	12.35	13.1	13.0	12.3	11.8	2.1	2.95	7.5	9.45
5	7.35	7.0	8.85	12.3	13.2	12.95	12.3	11.8	2.0	3.3	7.25	9.15
6	7.1	7.1	9.3	12.35	13.45	13.0	12.3	11.8	2.0	3.65	6.7	8.85
7	6.65	7.1	9.65	12.45	13.85	12.9	12.3	11.8	2.0	4.85	6.25	8.65
8	6.25	7.1	9.95	12.5	14.2	12.9	12.3	11.8	1.9	6.4	7.0	8.35
9	5.95	7.1	10.2	12.5	14.3	12.8	12.4	11.8	1.8	7.0	7.8	7.95
10	5.65	7.1	10.35	12.5	14.53	12.8	12.4	11.75	1.8	7.1	8.15	7.6
11	5.3	7.0	10.5	12.55	14.73	13.05	12.5	11.4	1.8	7.05	9.35	7.25
12	4.95	7.0	10.75	12.65	14.5	13.2	12.5	11.0	1.75	7.05	10.0	6.95
13	4.6	7.0	11.15	12.75	14.15	13.15	12.45	10.6	1.7	6.65	10.1	6.6
14	4.35	7.0	11.65	12.75	13.85	12.95	12.4	10.25	1.7	6.35	9.95	6.35
15	4.15	7.0	12.2	12.8	13.55	12.9	12.35	9.8	1.7	6.15	9.75	6.15
16	3.95	6.95	12.55	12.8	13.35	12.8	12.3	9.35	1.6	5.55	9.45	6.0
17	3.75	6.9	12.75	12.85	13.3	12.75	12.3	8.9	1.6	6.15	8.95	5.85
18	3.75	6.85	13.05	13.0	13.5	12.65	12.2	8.4	1.6	7.85	8.45	5.75
19	3.2	6.8	13.15	13.3	13.55	12.6	12.2	7.85	1.6	7.2	8.05	5.6
20	2.6	6.8	13.5	13.85	13.45	12.6	12.1	7.05	1.6	8.15	7.80	5.5
21	2.5	6.7	13.85	14.1	13.4	12.6	12.1	6.2	1.7	8.6	11.35	5.4
22	2.4	6.6	13.8	13.95	13.45	12.5	12.1	5.4	1.7	8.75	13.85	5.2
23	2.4	6.6	13.6	13.9	13.75	12.4	12.1	4.85	1.7	8.4	13.30	4.95
24	3.15	6.6	13.35	14.2	14.05	12.4	12.0	4.65	1.7	8.4	12.65	4.7
25	4.4	6.5	13.15	14.63	14.05	12.4	12.0	4.75	1.7	8.65	12.20	4.4
26	4.95	6.5	12.9	15.15	13.85	12.4	11.9	4.55	1.7	8.85	11.85	4.3
27	5.3	6.5	12.75	14.82	13.55	12.4	11.9	4.1	1.7	9.1	11.55	4.1
28	5.65	6.5	12.6	14.2	13.25	12.4	11.9	3.7	1.7	9.0	11.10	3.8
29	5.75	.....	12.55	13.7	13.15	12.4	11.9	3.2	1.7	8.9	10.80	3.65
30	6.0	.....	12.5	13.15	13.15	12.4	11.9	2.8	1.7	8.75	10.65	3.6
31	6.35	.....	12.4	.....	13.25	.....	11.9	2.25	.....	8.45	.....	3.5

NOTE.—Lake frozen until about Mar. 31. No ice in December.

Volume of storage on Clealum Lake near Roslyn, Wash., for 1909-10.

Gage height.	Storage.	Gage height.	Storage.	Gage height.	Storage.	Gage height.	Storage.
Feet.	*Acre-feet.*	*Feet.*	*Acre-feet.*	*Feet.*	*Acre-feet.*	*Feet.*	*Acre-feet.*
1.00	1,700	5.00	9,600	9.00	18,600	13.00	28,100
2.00	3,600	6.00	11,800	10.00	20,900	14.00	30,500
3.00	5,500	7.00	14,000	11.00	23,300	15.00	33,000
4.00	7,500	8.00	16,300	12.00	25,700	16.00	35,500

NOTE.—This table has been used to determine the amount of water in, or drawn from, the lake, and in connection with the records on Clealum River, to compute the inflow into the lake. This table differs slightly from that published in Water-Supply Paper 252. It is, however, the same as used by the United States Reclamation Service.

CLEALUM RIVER NEAR ROSLYN, WASH.

This station, which is located in sec. 10, T. 20 N., R. 14 E., 1,000 feet below the outlet of Lake Clealum, about 2½ miles northwest of Roslyn, Wash., was established October 10, 1903.

The gage is an inclined staff; its datum has not been changed since the station was established.

Discharge measurements are made from a cable about 500 feet below the gage. This cable was installed August 20, 1908, and is about 500 feet below the original site at which there was a little dead water at low stages. Ice does not interfere with the determination

of flow during the winter months. The outflow of the lake is controlled by a temporary timber dam completed by the Reclamation Service during the winter of 1907.

Before the dam was constructed the lake was used for storage by the Cascade Lumber Co., and the flow during the summer months was partly controlled, although the dam was of temporary construction and was replaced each season.

The conditions at the station favor good results and a permanent rating curve has been developed.

Discharge measurements of Clealum River near Roslyn, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 30	H. D. McGlashan	139	721	5.18	2,380
June 22	do	134	510	3.60	1,090
July 13	McGlashan and Storey	133	483	3.40	976
Aug. 31[a]	H. D. McGlashan	171	265	2.21	442
Sept. 1	R. H. Bolster	132	321	2.03	364
16[b]	Kimble and McGlashan			1.32	148
Oct. 7	F. B. Storey	134	507	3.52	1,070
Nov. 23	do	138	850	6.30	3,330

[a] Measured by wading. [b] Wading at mouth of Clealum River.

Daily gage height in feet, of Clealum River near Roslyn, Wash., for 1910.

[A. D. Nichols, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.06	2.36	2.26	3.53	4.80	5.38	3.30	2.16	2.06	1.43	2.92	3.50
2	2.94	2.26	2.24	3.59	4.56	5.17	3.25	2.12	1.94	1.58	2.82	3.46
3	2.86	2.31	2.27	3.50	4.49	4.74	3.23	2.08	1.89	2.00	3.02	3.42
4	2.78	2.36	2.32	3.38	4.66	4.42	3.22	1.99	1.80	2.72	2.90	3.39
5	2.81	2.34	2.28	3.32	4.82	4.39	3.23	1.98	1.74	3.06	2.88	3.35
6	2.83	2.30	2.25	3.42	5.24	4.46	3.22	2.03	1.71	3.24	3.22	3.32
7	2.88	2.32	2.28	3.55	5.93	4.41	3.22	2.06	1.67	3.54	3.58	3.29
8	2.90	2.32	2.24	3.61	6.47	4.24	3.21	2.08	1.64	3.76	3.72	3.26
9	2.80	2.32	2.26	3.60	6.57	4.09	3.30	2.11	1.60	3.83	3.78	3.21
10	2.72	2.30	2.24	3.63	7.01	4.09	3.37	2.70	1.55	3.84	3.85	3.16
11	2.80	2.28	2.19	3.66	7.42	4.54	3.40	2.90	1.51	3.79	3.94	3.11
12	2.76	2.26	2.20	3.94	6.85	4.98	3.41	3.12	1.48	3.86	4.04	3.04
13	2.62	2.26	2.23	4.09	6.34	4.72	3.40	3.11	1.41	3.75	4.06	3.00
14	2.50	2.25	2.46	4.00	5.84	4.36	3.32	3.10	1.36	3.88	4.01	2.92
15	2.40	2.24	3.29	3.92	5.40	4.24	3.18	3.12	1.32	3.71	3.97	2.78
16	2.28	2.22	3.95	3.94	5.06	4.17	3.08	3.12	1.32	3.68	3.92	2.59
17	2.19	2.19	4.31	4.06	5.02	4.06	3.00	3.12	1.31	2.10	3.88	2.57
18	2.17	2.18	4.58	4.37	5.30	3.86	2.92	3.11	1.31	.67	3.82	2.41
19	2.36	2.14	4.84	4.94	5.40	3.74	2.84	3.21	1.32	.84	3.74	2.37
20	2.41	2.12	5.38	5.64	5.20	3.79	2.75	3.30	1.32	.88	3.70	2.35
21	2.34	2.09	5.91	5.96	5.08	3.71	2.70	3.30	1.36	.92	5.70	2.42
22	2.26	2.18	5.94	5.67	5.24	3.57	2.66	3.31	1.36	2.07	7.12	2.44
23	2.26	2.24	5.63	5.58	5.68	3.41	2.65	3.29	1.38	3.00	6.30	2.46
24	2.26	2.20	5.17	6.22	6.18	3.31	2.58	2.80	1.39	2.92	5.38	2.66
25	2.28	2.16	5.74	6.99	6.27	3.30	2.50	2.40	1.40	3.15	4.74	2.72
26	2.30	2.14	4.36	7.90	5.88	3.38	2.40	2.40	1.39	3.20	4.24	2.68
27	2.32	2.17	4.10	7.48	5.39	3.45	2.34	2.40	1.36	3.22	3.94	2.66
28	2.40	2.20	3.90	6.44	5.01	3.42	2.30	2.40	1.35	3.15	3.77	2.64
29	2.37	.....	3.76	5.74	4.72	3.38	2.26	2.34	1.35	3.16	3.60	2.54
30	2.30	.....	3.62	5.13	4.73	3.32	2.22	2.26	1.35	3.07	3.54	2.50
31	2.40	.....	3.54	.....	4.92	.....	2.20	2.17	.....	2.98	.....	2.45

NOTE.—No ice.

Daily discharge, in second-feet, of Clealum River near Roslyn, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	790	478	443	1,050	1,930	2,480	910	408	374	184	720	1,030
2	730	443	436	1,080	1,730	2,270	885	395	334	223	670	1,010
3	690	460	446	1,030	1,670	1,880	875	381	317	354	770	982
4	651	478	464	958	1,810	1,620	870	351	289	624	710	964
5	665	471	450	922	1,950	1,590	875	347	271	795	700	940
6	675	457	440	982	2,340	1,650	870	364	262	880	870	922
7	700	464	450	1,060	3,080	1,610	870	374	250	1,050	1,080	905
8	710	464	436	1,100	3,710	1,490	865	381	241	1,190	1,160	890
9	660	464	443	1,090	3,830	1,380	910	391	229	1,230	1,200	865
10	624	457	436	1,110	4,390	1,380	952	615	214	1,230	1,240	840
11	660	450	419	1,130	4,960	1,710	970	710	203	1,200	1,290	815
12	642	443	422	1,290	4,180	2,090	976	820	195	1,250	1,350	780
13	579	443	432	1,380	3,560	1,860	970	815	179	1,180	1,370	760
14	530	440	515	1,330	2,980	1,570	922	810	169	1,260	1,340	725
15	492	436	905	1,280	2,500	1,490	850	820	160	1,160	1,310	651
16	450	429	1,300	1,290	2,160	1,440	800	820	160	1,140	1,280	566
17	419	419	1,540	1,370	2,130	1,370	760	820	158	388	1,260	558
18	412	415	1,740	1,580	2,400	1,250	720	815	158	70	1,220	496
19	478	402	1,970	2,060	2,500	1,170	680	865	160	88	1,170	482
20	496	395	2,480	2,760	2,300	1,200	638	910	160	93	1,150	474
21	471	385	3,060	3,120	2,180	1,160	615	910	169	98	2,830	500
22	443	415	3,090	2,800	2,340	1,070	597	916	169	378	4,540	507
23	443	436	2,750	2,700	2,810	976	592	905	173	760	3,510	515
24	433	422	2,270	3,410	3,370	916	562	660	175	720	2,480	597
25	450	408	2,870	4,370	3,470	910	530	492	177	835	1,880	624
26	457	402	1,570	5,650	3,030	958	492	492	175	860	1,490	606
27	464	412	1,390	5,050	2,490	1,000	471	492	169	870	1,290	597
28	492	422	1,270	3,680	2,120	982	457	492	166	835	1,190	588
29	482	.....	1,190	2,870	1,860	958	443	471	166	840	1,090	546
30	457	.....	1,100	2,230	1,870	922	429	443	166	795	1,050	530
31	492	.....	1,050	.....	2,040	.....	422	412	.....	750	.....	511

NOTE.—Daily discharge determined from a discharge rating curve well defined above 200 second-feet. Above 1,330 second-feet this curve coincides with that for 1909.

Monthly discharge of Clealum River near Roslyn, Wash., for 1910.

[Drainage area, 205 square miles.]

Month.	Discharge in second-feet.			Run-off (total in acre-feet).			Discharge without storage (second-feet).		Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.		
January	790	412	553	34,000	− 6,030	28,000	455	2.22	2.56	A.
February	478	385	436	24,200	+ 330	24,500	441	2.15	2.24	A.
March	3,090	419	1,220	75,000	+13,800	88,800	1,440	7.02	8.09	A.
April	5,650	922	2,060	123,000	+ 1,800	125,000	2,100	10.2	11.38	A.
May	4,960	1,670	2,700	166,000	+ 240	166,000	2,700	13.2	15.22	A.
June	2,480	910	1,410	83,900	− 2,040	81,900	1,380	6.74	7.52	A.
July	976	422	735	45,200	− 1,200	44,000	716	3.49	4.02	A.
August	916	347	610	37,500	−21,400	16,100	262	1.28	1.48	A.
September	374	158	206	12,300	− 1,040	11,300	190	.927	1.03	B.
October	1,260	70	753	46,300	+14,300	60,600	986	4.81	5.54	B.
November	4,540	670	1,440	85,700	+ 5,120	90,800	1,530	7.46	8.32	A.
December	1,030	474	702	43,200	−16,000	27,200	442	2.16	2.49	A.
The year	5,650	70	1,070	776,000	−12,100	764,000	1,050	5.12	69.89	

TEANAWAY RIVER NEAR CLEALUM, WASH.

This station, which is located in the NE. ¼ sec. 3, T. 19 N., R. 16 E., at the lower Teanaway highway bridge 4½ miles southeast of Clealum, Wash., about half a mile above the mouth and below all diversions for irrigation, was established April 2, 1909.

A number of important irrigation ditches take water above the station; no site could be selected above these ditches.

The chain gage is attached to the downstream side of the bridge.

Discharge measurements are made from the bridge.

The right bank is high and of cemented gravel; the left bank is low and wooded and subject to overflow during high stages. The bed of the stream is of hard clay and gravel and shifts during freshets. Conditions for measurements at medium and high stages are poor, owing to the roughness of the channel and the angle made by the current with the bridge.

In the spring the relation between gage height and discharge is affected by backwater caused by logs in the channel and some unusual fluctuations in the discharge are also caused by the daily release of water for log driving from the splash dams on the forks of the stream 20 miles above the station.

Winter gage heights are considerably affected by ice. A fair discharge rating curve, however, has been constructed, and the results obtained during the summer and fall months may be considered reliable.

Discharge measurements of Teanaway River near Clealum, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 28	H. D. McGlashan	118	277	5.20	1,390
June 2	do	107	160	4.08	470
22	do	99	90.2	3.19	207
July 27[a]	McGlashan and Storey	41	45.6	2.17	33.9
Aug. 31[a]	F. B. Storey	21.5	9.22	1.70	7.88
Nov. 23	do	104	226	4.71	975

[a] Measured by wading.

Daily gage height, in feet, of Teanaway River near Clealum, Wash., for 1910.

[Athene Clymer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.79	.....	.....	4.44	4.70	4.34	2.80	1.94	1.72	1.68	2.51	3.66
2	3.87	.....	.....	4.22	4.60	4.10	2.80	1.92	1.69	1.68	2.50	3.60
3	3.84	.....	7.50	3.98	4.63	3.92	2.77	1.88	1.68	2.64	2.53	3.52
4	3.88	.....	6.18	3.97	4.67	3.86	2.75	1.85	1.67	3.49	2.51	3.52
5	3.98	.....	4.70	4.08	4.77	3.84	2.74	1.83	1.66	3.35	2.47	3.48
6	4.06	.....	4.55	4.45	5.10	3.90	2.73	1.80	1.67	3.39	2.56	3.47
7	4.05	.....	4.20	4.24	5.33	3.86	2.70	1.81	1.68	3.69	2.80	3.44
8	3.92	.....	4.03	4.12	5.40	3.75	2.76	1.80	1.70	3.52	3.78	3.43
9	3.80	.....	4.00	3.97	5.28	3.66	2.75	1.79	1.70	3.40	3.57	3.42
10	3.73	.....	3.74	4.23	5.46	3.72	2.63	1.76	1.71	3.25	3.53	3.38
11	3.66	.....	4.45	5.00	5.22	3.87	2.59	1.71	1.71	3.12	3.98	3.31
12	3.61	.....	4.25	5.40	4.98	3.82	2.50	1.65	1.71	2.98	3.86	3.33
13	3.46	.....	5.00	5.15	4.81	3.66	2.50	1.65	1.69	2.90	3.72	3.27
14	3.38	.....	5.65	4.72	4.70	3.60	2.52	1.62	1.69	2.80	3.50	3.24
15	3.40	.....	5.80	4.45	4.52	3.70	2.36	1.63	1.69	2.95	3.40	3.21
16	3.33	.....	5.55	4.52	4.47	3.50	2.40	1.65	1.69	2.68	3.33	3.19
17	3.32	.....	6.05	4.80	4.48	3.45	.....	1.64	1.72	2.67	3.30	3.18
18	3.27	.....	6.30	5.02	4.62	3.37	2.27	1.58	1.72	2.99	3.29	3.17
19	3.23	.....	6.15	5.90	4.54	3.36	2.22	1.56	1.71	2.86	3.37	3.10
20	3.55	.....	7.02	6.30	4.45	3.38	2.21	1.54	1.70	2.64	3.22	3.07
21	3.45	.....	7.05	5.98	4.40	3.32	2.20	1.53	1.71	2.77	6.15	3.05
22	3.49	.....	6.58	5.70	4.45	3.27	2.15	1.62	1.69	2.72	5.30	3.00
23	3.82	.....	6.20	5.73	4.66	3.16	2.09	1.60	1.70	2.70	4.75	3.20
24	6.08	.....	5.68	6.40	4.76	3.11	2.09	1.60	1.69	2.64	4.40	3.34
25	.....	.....	5.26	6.53	4.70	2.98	2.09	1.58	1.68	2.67	4.20	3.20
26	.....	.....	4.76	6.56	4.42	2.98	2.16	1.60	1.69	2.65	3.98	3.25
27	.....	.....	4.76	5.90	4.28	3.03	2.17	1.60	1.68	2.60	3.90	3.20
28	.....	.....	4.58	5.35	4.09	2.88	2.18	1.60	1.67	2.58	3.77	3.19
29	.....	.....	4.60	5.03	4.07	2.88	2.13	1.65	1.67	2.55	3.76	3.16
30	.....	.....	4.32	4.85	4.07	2.80	2.05	1.68	1.68	2.53	3.64	3.17
31	.....	.....	4.40	.....	4.18	.....	2.02	1.70	.....	2.51	.....	3.14

NOTE.—River entirely frozen over Jan. 1 to 23, the ice reaching a thickness of about 1.0 foot; gage heights read to water surface through hole in ice. Ice jam formed Jan. 24 and broke Mar. 2. Probably no ice during December.

Daily discharge, in second-feet, of Teanaway River near Clealum, Wash., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,300	788	970	720	114	19	8.8	7.4	68	371
2	1,220	644	900	574	114	18	7.7	7.4	67	346
3	1,140	513	921	484	109	16	7.4	87	71	308
4	1,060	508	949	457	106	14	7.1	304	68	316
5	970	564	1,020	448	104	14	6.8	256	63	301
6	865	795	1,290	475	102	12	7.1	270	75	298
7	632	657	1,500	457	97	12	7.4	383	114	287
8	538	586	1,570	408	107	12	8	316	421	284
9	522	508	1,450	371	106	12	8	273	335	280
10	404	651	1,630	396	86	10	8.4	224	319	266
11	795	1,200	1,400	462	80	8.4	8.4	186	513	242
12	663	1,570	1,280	439	67	6.5	8.4	152	457	249
13	1,200	1,340	1,050	371	67	6.5	7.7	134	396	230
14	1,820	985	970	346	70	5.6	7.7	114	308	221
15	1,990	795	844	387	51	5.9	7.7	145	273	212
16	1,720	844	809	308	55	6.5	7.7	94	249	206
17	2,300	1,040	816	290	48	6.2	8.8	92	239	203
18	2,620	1,220	914	263	42	4.4	8.8	154	236	200
19	2,420	2,110	858	259	38	3.8	8.4	126	263	180
20	3,710	2,620	795	266	37	3.2	8	87	215	173
21	3,760	2,210	760	246	36	2.9	8.4	109	2,420	168
22	2,980	1,880	795	230	32	5.6	7.7	100	1,420	156
23	2,490	1,910	942	197	28	5	8	97	1,010	209
24	1,860	2,750	1,020	183	28	5	7.7	87	760	253
25	1,430	2,920	970	152	28	4.4	7.4	92	632	209
26	1,020	2,960	774	152	33	5	7.7	89	513	224
27	1,020	2,110	682	163	34	5	7.4	81	475	209
28	886	1,520	569	130	35	5	7.1	78	417	206
29	900	1,230	558	130	31	6.5	7.1	74	413	197
30	707	1,080	558	114	26	7.4	7.4	71	362	200
31	760	.....	620	.....	23	8	.....	68	.....	192

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve. Discharge Mar. 1 and 2 estimated.

Monthly discharge of Teanaway River near Clealum, Wash., for 1910.

[Drainage area, 214 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	.....	.....	150	.701	0.81	9,220	C.
February	.....	.....	120	.561	.58	6,660	D.
March	3,760	404	1,470	6.87	7.92	90,400	C.
April	2,960	508	1,350	6.31	7.04	80,300	B.
May	1,630	558	974	4.55	5.25	59,900	C.
June	720	114	329	1.54	1.72	19,600	C.
July	114	23	62.4	.292	.34	3,840	B.
August	19	2.9	8.25	.039	.04	507	B.
September	8.8	6.8	7.81	.036	.04	465	B.
October	383	7.4	141	.659	.76	8,670	B.
November	2,420	63	439	2.05	2.29	26,100	B.
December	371	156	239	1.12	1.29	14,700	B.
The year	3,760	2.9	443	2.07	28.08	320,000	

NOTE.—Monthly means for January and February estimated by comparison with records derived from observations at other stations in the vicinity not affected by ice.

SWAUK CREEK NEAR CLEALUM, WASH.

This station, which is located in the SE. ¼ sec. 5, T. 19 N., R. 17 E., 1½ miles above the mouth of Swauk Creek, in a narrow canyon on the ranch of B. F. Boice, 12 miles southeast of Clealum, was established April 3, 1909.

The canyon of the stream is comparatively narrow and a large part of the water diverted for irrigation is taken out by small ditches and is returned to the stream above the station. One high-line ditch diverts water to lands in the vicinity of Ellensburg, thus taking it out of the drainage area altogether.

The gage is a vertical staff fastened to a stump on the right bank 500 feet below the farmhouse; the gage datum has not been changed.

Discharge measurements are made from a wagon bridge or by wading.

The banks of the stream are comparatively high and will not overflow except during extreme flood. The bed of the stream is of sand and gravel and liable to change during floods.

A well-defined discharge rating curve has been constructed, and the record, except during winter months when the relation between gage heights and discharge is liable to be somewhat affected by ice, may be considered excellent.

Discharge measurements of Swauk Creek near Clealum, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 13	H. D. McGlashan	30	75.6	3.25	278
June 2	do	25	25.7	1.54	29.5
July 27[a]	McGlashan and Storey	9	5.6	1.10	2.2
Aug. 31[a]	R. H. Bolster	5.5	1.82	1.00	.49

[a] Measured by wading.

Daily gage height, in feet, of Swauk Creek near Clealum, Wash., for 1910.

[B. F. Boice, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.06	2.30	3.30	3.15	2.70	1.56	1.26	1.06	1.00	1.22	1.32	1.52
2	2.05	2.40	5.30	3.12	.....	1.54	1.24	1.06	1.00	1.22	1.33	1.51
3	2.05	2.52	4.85	3.00	2.55	1.52	1.23	1.06	1.00	1.24	1.34	1.50
4	2.06	2.62	4.15	2.92	2.55	1.51	1.22	1.05	1.00	1.40	1.36	1.51
5	2.08	2.76	3.85	2.95	2.55	1.50	1.20	1.04	1.00	1.40	1.36	1.51
6	2.10	2.62	3.58	3.00	2.52	1.49	1.10	1.04	1.00	1.34	1.38	1.51
7	2.20	2.54	3.40	2.98	2.55	1.48	1.11	1.04	1.01	1.31	1.40	1.51
8	2.20	2.54	3.35	2.95	2.55	1.45	1.11	1.04	1.01	1.32	1.40	1.51
9	2.20	2.46	3.40	2.95	2.56	1.41	1.10	1.04	1.01	1.29	1.42	1.51
10	2.18	2.55	3.65	3.00	2.58	1.40	1.09	1.03	1.02	1.27	1.43	1.51
11	2.16	2.45	3.98	3.08	2.48	1.40	1.06	1.03	1.02	1.27	1.45	1.51
12	2.18	2.35	4.40	3.30	2.30	1.40	1.04	1.03	1.02	1.27	1.45	1.51
13	2.17	2.32	5.15	3.30	2.20	1.40	1.02	1.03	1.02	1.27	1.50	1.51
14	2.15	2.20	5.45	3.18	2.12	1.38	1.02	1.02	1.02	1.27	1.61	1.56
15	2.12	2.18	5.45	3.02	2.12	1.35	1.01	1.02	1.03	1.27	1.68	1.52
16	2.10	2.10	5.55	3.05	2.00	1.35	1.01	1.02	1.04	1.27	1.69	1.50
17	2.08	2.20	5.45	3.05	1.98	1.36	1.01	1.02	1.06	1.28	1.74	1.50
18	2.06	2.15	5.40	3.20	1.90	1.36	1.01	1.02	1.06	1.32	1.92	1.44
19	2.06	2.10	5.79	3.60	1.88	1.33	1.01	1.02	1.08	1.32	1.98	1.42
20	2.00	2.10	5.95	3.72	1.84	1.32	1.01	1.01	1.10	1.32	2.12	1.42
21	2.03	2.15	5.62	3.58	1.80	1.36	1.01	1.00	1.10	1.32	2.23	1.43
22	2.06	2.15	5.35	3.45	1.75	1.38	1.02	1.00	1.11	1.31	2.09	1.44
23	2.20	2.10	4.90	3.48	1.67	1.39	1.03	1.00	1.12	1.31	2.08	1.46
24	3.07	2.15	4.40	3.60	1.70	1.38	1.06	1.01	1.16	1.31	2.06	1.46
25	3.06	2.20	4.05	3.80	1.69	1.25	1.09	1.01	1.14	1.31	2.04	1.45
26	2.80	2.35	3.82	3.82	1.68	1.28	1.05	1.01	1.14	1.31	2.10	1.44
27	2.71	2.28	3.65	3.55	1.67	1.29	1.01	1.01	1.14	1.31	2.09	1.44
28	2.69	3.00	3.45	3.30	1.66	1.28	1.01	1.01	1.16	1.31	1.72	1.44
29	2.64	.....	3.30	3.10	1.62	1.28	1.04	1.00	1.17	1.32	1.53	1.43
30	2.62	.....	3.20	2.90	1.58	1.28	1.06	1.00	1.18	1.32	1.52	1.43
31	2.44	.....	3.15	.....	1.60	.....	1.06	1.00	.....	1.32	.....	1.43

NOTE.—No ice reported by observer, but gage readings were probably somewhat affected by freezing during January and February.

Daily discharge, in second-feet, of Swauk Creek near Clealum, Wash., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	290	257	170	31	9.2	1.5	0.5	7	13	28
2	793	250	158	29	8.0	1.5	.5	7	14	27
3	672	226	145	28	7.4	1.5	.5	8	14	27
4	490	210	145	27	6.7	1.4	.5	19	16	27
5	416	216	145	26	5.5	1.2	.5	19	16	27
6	353	226	140	25	2.2	1.2	.5	14	17	27
7	312	222	145	25	2.5	1.2	.7	12	19	27
8	301	216	145	22	2.5	1.2	.7	12	19	27
9	312	216	147	19	2.2	1.2	.7	11	20	27
10	370	226	150	19	2.0	1.0	.8	10	21	27
11	448	242	134	19	1.5	1.0	.8	10	22	27
12	554	290	108	19	1.2	1.0	.8	10	22	27
13	752	290	95	19	.8	1.0	.8	10	26	27
14	835	264	86	17	.8	.8	.8	10	35	31
15	835	230	86	15	.7	.8	1.0	10	41	28
16	863	236	73	15	.7	.8	1.2	10	42	26
17	835	236	71	16	.7	.8	1.5	10	47	26
18	821	270	63	16	.7	.8	1.5	13	65	22
19	930	358	61	14	.7	.8	1.9	13	71	20
20	975	386	57	13	.7	.7	2.2	13	86	20
21	883	353	53	16	.7	.5	2.2	13	99	21
22	807	324	48	17	.8	.5	2.5	12	83	22
23	685	330	40	18	1.0	.5	2.9	12	82	23
24	554	358	43	17	1.5	.7	4.2	12	80	23
25	466	404	42	8.6	2.0	.7	3.5	12	77	22
26	408	409	41	10	1.4	.7	3.5	12	84	22
27	370	346	40	11	.7	.7	3.5	12	83	22
28	324	290	39	10	.7	.7	4.2	12	45	22
29	290	246	36	10	1.2	.5	4.5	13	28	21
30	268	206	32	10	1.5	.5	4.8	13	28	21
31	257	.....	34	.....	1.5	.5	.....	13	.....	21

NOTE.—Daily discharge determined from a discharge rating curve well defined below 300 second-feet.

Monthly discharge of Swauk Creek near Clealum, Wash., for 1910.

[Drainage area, 90 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January			80	0.888	1.02	4,920	C.
February			70	.777	.81	3,890	C.
March	975	257	564	6.27	7.23	34,700	B.
April	409	206	278	3.09	3.45	16,500	A.
May	170	32	89.4	.993	1.14	5,500	A.
June	31	8.6	18.1	.201	.22	1,080	A.
July	9.2	.7	2.25	.025	.03	138	A.
August	1.5	.5	.90	.010	.01	55.3	A.
September	4.8	.5	1.81	.020	.02	108	A.
October	19	7	11.7	.130	.15	719	A.
November	99	13	43.8	.487	.54	2,610	A.
December	31	20	24.7	.274	.32	1,520	B.
The year	975	.5	99.0	1.10	14.94	71,700	

NOTE.—Monthly means for January and February estimated because of probable presence of ice.

TANEUM CREEK NEAR THORP, WASH.

This station, which is located in sec. 1, T. 18 N., R. 16 E., 16½ miles above Thorp, 150 feet below the logging bridge on the ranch of G. D. De Shazer, was established April 4, 1909.

Many ditches take water from this creek and it was necessary to locate the station above them. The highest ditch of importance is Bruton's, which heads one-fourth mile below the station.

The gage is a vertical staff fixed to an 8-inch cottonwood tree on the left bank.

Measurements are made by wading in the vicinity of the station.

The banks of the stream are low, covered with brush, and subject to overflow. The bed of the stream is of sand and gravel and is liable to change at medium and high stages.

In November, 1910, a new gage was installed in sec. 6, T. 18 N., R. 17 E., one-fourth mile downstream. This gage is a vertical staff nailed to a stump in the dooryard of the De Shazer ranch, about 300 feet below the head gate of the Bruton ditch. Simultaneous readings on the two gages were obtained, but the new gage is not yet rated.

Discharge measurements of Taneum Creek near Thorp, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 14	H. D. McGlashan	33	53	4.7	275
June 10[a]	H. Kimble	26	35	4.3	61.1
July 29[a]	McGlashan and Storey	27	16	3.68	12.9
Aug. 29[a]	F. B. Storey	21.5	14	3.61	8.33
Nov. 16	do	23	21	[b] 3.90	18.5

[a] Measured by wading. [b] New gage read 0.83 foot.

Daily gage height, in feet, of Taneum Creek near Thorp, Wash., for 1910.

[Old gage. Warren De Shazer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	4.6	5.4	4.4	3.9	3.45	3.55	3.65	3.9	.....
2	.....	.....	2.84	4.6	5.3	4.5	3.9	3.4	3.55	3.8	3.9	4.0
3	.....	.....	3.7	4.5	5.2	4.5	3.9	3.4	3.55	3.8	3.9	.....
4	.....	3.01	4.0	4.5	5.1	4.45	3.9	3.4	3.55	3.8	3.9	.....
5	.....	.....	3.4	.....	5.2	4.4	3.9	3.4	3.55	3.8	3.9	.....
6	.....	3.31	.....	4.41	5.3	4.4	3.9	3.4	3.6	3.75	3.9	.....
7	.....	3.0	3.1	4.4	5.6	4.45	3.9	3.4	3.6	3.75	3.9	.....
8	.....	.....	3.0	4.4	5.05	4.45	3.85	3.45	3.6	3.75	3.9	.....
9	.....	3.0	.....	.....	5.5	4.35	3.85	3.45	3.6	3.8	3.9	.....
10	.....	.....	3.0	4.41	5.8	4.3	3.85	3.5	3.6	3.8	3.9	3.86
11	.....	.....	.....	4.42	5.6	4.3	3.85	3.5	3.6	3.8	3.9	.....
12	.....	.....	.....	4.43	5.4	4.25	3.85	3.5	3.65	3.85	3.9	.....
13	.....	.....	3.52	4.9	5.2	4.2	3.85	3.5	3.65	3.85	3.95	.....
14	.....	.....	3.9	4.64	4.9	4.2	3.8	3.5	3.65	3.9	.....	.....
15	.....	.....	4.15	4.63	4.8	4.2	3.8	3.5	3.65	3.9	.....	3.9
16	.....	2.5	4.25	.....	4.8	4.2	3.75	3.5	3.65	3.9	.....	.....
17	.....	.....	.....	4.62	4.7	4.15	3.75	3.5	3.65	3.9	.....	.....
18	.....	.....	4.6	6.0	4.6	4.1	3.75	3.5	3.7	3.9	3.9	.....
19	.....	.....	4.7	6.2	4.6	4.1	3.75	3.5	3.7	3.9	.....	.....
20	.....	.....	5.7	5.8	4.8	4.05	3.75	3.5	3.7	3.9	.....	.....
21	.....	.....	6.3	5.5	4.8	4.0	3.75	3.5	3.75	3.9	.....	.....
22	.....	.....	6.2	5.4	4.9	4.0	3.75	3.5	3.8	3.9	.....	.....
23	.....	.....	5.7	5.3	4.78	4.0	3.75	3.5	3.75	3.9	.....	.....
24	.....	.....	5.1	5.3	4.79	4.0	3.7	3.5	3.7	3.9	.....	3.88
25	.....	.....	4.9	6.0	4.81	4.0	3.7	3.5	3.6	3.9	.....	.....
26	.....	1.5	4.1	6.6	4.76	4.0	3.65	3.5	3.6	3.9	4.1	.....
27	.....	.....	4.1	6.8	4.75	4.0	3.65	3.5	3.6	3.9	.....	.....
28	2.05	.....	4.1	6.8	4.8	4.0	3.6	3.55	3.6	3.9	.....	.....
29	.....	.....	4.2	6.2	4.8	4.0	3.6	3.55	3.65	3.9	.....	.....
30	.....	.....	4.4	5.6	4.75	3.95	3.6	3.55	3.65	3.9	.....	3.85
31	.....	.....	4.5	.....	4.5	.....	3.55	3.55	.....	3.9	.....	.....

[New gage.]

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1	.....	0.87	11	.....	0.80	21	1.01	0.75
2	.....	.86	12	.....	.80	22	1.15	.76
3	.....	.89	13	.....	.87	23	1.07	.78
4	.....	.87	14	.....	.82	24	.61	.80
5	.....	.85	15	.....	.81	25	.60	.86
6	.....	.85	16	0.62	.80	26	.85	.86
7	.....	.85	17	.63	.80	27	.95	.86
8	.....	.85	18	.71	.80	28	.95	.82
9	.....	.83	19	.72	.80	29	.92	.80
10	.....	.80	20	.72	.81	30	.86	.81
						31	.....	.83

NOTE.—Creek probably frozen during January and February. No ice notes during this period.

Daily discharge, in second-feet, of Taneum Creek near Thorp, Wash., for 1910.

Day.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.
1	69	259	230	75	21	6.5	7.5	9	21
2	69	259	212	88	21	6	7.5	14	21
3	196	242	195	88	21	6	7.5	14	21
4	245	242	178	82	21	6	7.5	14	21
5	148	234	195	75	21	6	7.5	14	21
6	126	227	212	75	21	6	8	12	21
7	104	225	266	82	21	6	8	12	21
8	90	225	170	82	18	6.5	8	12	21
9	90	226	248	68	18	6.5	8	14	21
10	90	227	304	62	18	7	8	14	21
11	116	228	266	62	18	7	8	14	21
12	142	230	230	56	18	7	9	18	21
13	167	310	195	50	18	7	9	18	24
14	228	266	147	50	14	7	9	21	23
15	270	264	132	50	14	7	9	21	22
16	288	263	132	50	12	7	9	21	.....
17	319	262	117	44	12	7	9	21	.....
18	350	515	102	38	12	7	10	21	.....
19	368	555	102	38	12	7	10	21	.....
20	556	304	132	33	12	7	10	21	.....
21	674	248	132	28	12	7	12	21	.....
22	555	230	147	28	12	7	14	21	.....
23	456	212	129	28	12	7	12	21	.....
24	395	212	120	28	10	7	10	21	.....
25	310	342	134	28	10	7	8	21	.....
26	177	462	126	28	9	7	8	21	.....
27	177	502	124	28	9	7	8	21	.....
28	177	502	132	28	8	7.5	8	21	.....
29	193	382	132	28	8	7.5	9	21	.....
30	225	266	124	24	8	7.5	9	21	.....
31	242	.....	88	.....	7.5	7.5	.....	21	.....

NOTE.—Daily discharge determined as follows: Mar. 1 to 21, from a discharge rating curve fairly well defined below 200 second-feet; Mar. 22 to Apr. 19, from a curve poorly defined; Apr. 20 to Dec. 31, from a curve fairly well defined below 100 second-feet. Daily discharge Nov. 16 to Dec. 31 withheld, as the gage heights read on the lower gage, when rated, will probably give better results than the readings on the upper gage. No estimates possible for January and February.

Monthly discharge of Taneum Creek near Thorp, Wash., for 1910.

[Drainage area, 76 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
March	674	69	245	3.22	3.71	15,100	C.
April	555	212	297	3.92	4.37	17,700	C.
May	304	88	167	2.20	2.54	10,300	C.
June	88	24	50.8	.668	.75	3,020	B.
July	21	7.5	14.5	.191	.22	892	C.
August	7.5	6	6.8	.089	.10	418	C.
September	14	7.5	8.9	.117	.13	530	C.
October	21	9	18.0	.237	.27	1,110	C.
The period	.....	.....	.....	.....	.....	49,100	

MANASTASH CREEK NEAR ELLENSBURG, WASH.

This station, which is located in sec. 15, T. 17 N., R. 17 E., a short distance above the mouth of the canyon at a private bridge on the ranch of A. L. Sackett, and 8½ miles west of Ellensburg, Wash., was established April 5, 1909.

Below the canyon the creek spreads in a number of channels and its water is diverted at many points for irrigation. The amount

measured at the station, which is at the only suitable point where all the waters are confined in one channel, is considerably reduced by evaporation before the creek reaches Yakima River, into which it finally flows through several channels.

The gage is a vertical staff spiked to a balm tree on the left bank 35 feet below the bridge.

Measurements are made from the farm bridge above the gage or by wading.

The banks of the stream are free from vegetation and are subject to overflow in extremely high water. The bed is of gravel and is permanent.

The discharge rating curve is well defined and the record may be considered excellent.

Discharge measurements of Manastash Creek near Ellensburg, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 14	H. D. McGlashan	30	41	2.31	197
June 11[a]	do	27	31.5	1.83	74.8
July 28[a]	McGlashan and Storey	18	13.5	1.31	16.6

[a] Measured by wading.

Daily gage height, in feet, of Manastash Creek near Ellensburg, Wash., for 1910.

[A. L. Sackett, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.55	1.68	2.18	2.50	2.10	1.58	1.30	1.30	1.24	1.24	1.35
2	.....	1.40	2.21	2.17	2.44	2.08	1.56	1.30	1.30	1.24	1.25	1.34
3	.....	1.55	2.35	2.16	2.29	2.05	1.54	1.30	1.30	1.26	1.25	1.33
4	.....	1.54	2.25	2.14	2.30	2.00	1.53	1.30	1.29	1.34	.....	1.33
5	.....	1.53	2.12	2.13	2.30	2.05	1.52	1.32	1.28	1.33	1.25	1.32
6	.....	1.50	1.97	2.20	2.42	2.05	1.51	1.38	1.29	1.32	1.25	1.31
7	.....	1.52	1.95	2.18	2.52	1.98	1.51	1.40	1.30	1.31	1.30	1.31
8	.....	1.53	1.96	2.20	2.62	1.96	1.50	1.38	1.29	1.30	1.32	1.32
9	.....	1.52	1.98	2.18	2.68	1.95	1.50	1.34	1.28	1.29	1.31	1.32
10	.....	1.48	2.00	2.20	2.92	.....	1.48	1.32	1.27	1.28	1.30	1.30
11	.....	1.49	2.30	2.26	2.85	1.92	1.46	1.30	1.26	1.27	1.46	1.30
12	.....	1.42	2.56	2.50	2.80	1.91	1.45	1.29	1.26	1.27	1.45	1.30
13	.....	1.45	2.64	2.42	2.60	1.91	1.45	1.27	1.26	1.27	.....	1.31
14	.....	1.45	2.68	2.41	2.50	1.84	1.44	1.26	1.25	1.27	.....	1.31
15	1.60	.....	2.75	2.35	.....	1.80	1.43	1.27	1.24	1.27	.....	1.32
16	1.60	1.44	2.75	2.32	2.35	1.78	1.42	1.28	1.24	1.26	.....	1.31
17	1.56	1.45	2.86	2.40	2.32	1.76	1.40	1.27	1.28	1.26	.....	1.30
18	1.51	1.45	2.84	2.45	2.38	1.75	1.40	1.26	1.27	1.26	.....	1.31
19	1.48	1.44	3.30	2.65	2.35	1.78	1.39	1.24	1.26	.....	1.40	1.30
20	1.42	1.43	3.66	2.82	2.32	1.78	1.38	1.24	1.26	1.26	1.40	1.31
21	1.40	1.45	3.50	2.75	2.30	1.75	1.38	1.25	1.28	1.26	1.45	1.30
22	1.60	1.44	3.23	2.70	2.30	1.72	1.38	1.24	1.26	1.26	1.47	1.30
23	1.70	1.43	3.05	2.77	2.35	1.70	1.39	1.25	1.26	1.26	1.45	1.29
24	1.62	1.42	2.78	2.80	2.41	1.69	1.38	1.25	1.25	1.26	1.36	1.28
25	1.60	1.41	2.62	2.95	2.38	1.65	1.36	1.25	1.24	1.25	1.30	1.29
26	1.62	1.40	2.48	3.05	2.30	1.64	1.36	1.25	1.22	1.25	1.32	1.30
27	1.60	1.40	2.36	2.85	2.25	1.62	1.36	1.25	1.21	1.24	1.35	1.33
28	.....	1.40	2.34	2.70	2.18	1.61	1.34	1.25	1.22	1.24	1.35	1.33
29	.....	.....	2.33	2.58	2.18	1.60	1.33	1.25	1.22	1.25	1.35	1.34
30	1.58	.....	2.20	2.50	2.12	1.59	1.32	1.26	1.24	1.25	1.35	1.35
31	1.55	.....	2.19	.....	2.15	.....	1.31	1.30	.....	1.25	.....	1.35

NOTE.—Creek frozen over Jan. 1 to 15 and gage so covered with ice that no readings could be obtained. A little ice along the edge during December; gage readings probably not materially affected thereby.

Daily discharge, in second-feet, of Manastash Creek near Ellensburg, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	45	40	55	156	264	133	43	16	16	12	12	20
2	45	24	165	153	242	128	41	16	16	12	13	19
3	45	40	210	150	190	120	38	16	16	14	13	18
4	45	38	178	145	193	108	37	16	15	19	13	18
5	45	37	139	142	193	120	36	18	15	18	13	18
6	45	34	102	162	235	120	35	22	15	18	13	17
7	45	36	98	156	271	104	35	24	16	17	16	17
8	45	37	100	162	307	100	34	22	15	16	18	18
9	45	36	104	156	329	98	34	19	15	15	17	18
10	45	32	108	162	415	94	32	18	14	15	16	16
11	45	33	193	181	390	91	30	16	14	14	30	16
12	45	26	286	264	372	89	29	15	14	14	29	16
13	45	29	314	235	300	89	29	14	14	14	28	17
14	45	29	329	232	264	77	28	14	13	14	27	17
15	45	28	354	210	237	71	27	14	12	14	26	18
16	45	28	354	200	210	68	26	15	12	14	25	17
17	41	29	394	228	200	65	24	14	15	14	25	16
18	35	29	386	246	221	64	24	14	14	14	24	17
19	32	28	552	318	210	68	23	12	14	14	24	16
20	26	27	682	379	200	68	22	12	14	14	24	17
21	24	29	624	354	193	64	22	13	15	14	29	16
22	45	28	527	336	193	60	22	13	14	14	31	16
23	57	27	462	361	210	57	23	13	14	14	29	15
24	47	26	365	372	232	56	22	13	13	14	21	15
25	45	25	307	426	221	51	21	13	12	13	16	15
26	47	24	257	462	193	50	21	13	11	13	18	16
27	45	24	214	390	178	47	21	13	11	12	20	18
28	45	24	207	336	156	46	19	13	11	12	20	18
29	44	.....	204	293	156	45	18	13	11	13	20	19
30	43	.....	162	264	139	44	18	14	12	13	20	20
31	40	.....	158	.....	148	.....	17	16	.....	13	.....	20

NOTE.—Daily discharge determined from a discharge rating curve well defined below 300 second-feet, below 264 second-feet the curve practically coincides with that for 1909. Daily discharge Jan. 1 to 14; estimated at 45 second-feet.

Monthly discharge of Manastash Creek near Ellensburg, Wash., for 1910.

[Drainage area, 74 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	57	24	43.1	0.582	0.67	2,650	C.
February	40	24	30.2	.408	.42	1,680	B.
March	682	55	277	3.74	4.31	17,000	C.
April	462	142	254	3.43	3.83	15,100	C.
May	415	139	234	3.16	3.64	14,400	B.
June	133	44	79.8	1.08	1.20	4,750	A.
July	43	17	27.5	.372	.43	1,690	A.
August	24	12	15.3	.207	.24	941	A.
September	16	11	13.8	.186	.21	821	A.
October	19	12	14.2	.192	.22	873	A.
November	31	12	21.0	.284	.32	1,250	B.
December	20	15	17.2	.232	.27	1,060	B.
The year	682	11	86.0	1.19	15.76	62,200	

WENAS CREEK NEAR SELAH, WASH.

This station, which is located about one-half mile above the mouth of the creek in the SE. ¼ sec. 18, T. 19 N., R. 14 E., was established March 30, 1909. The station is below all diversions for irrigation and just above a rocky gorge through which the creek flows to its junction with Yakima River.

The gage is a vertical staff on the left bank 200 feet below the ford on Walter Hustead's ranch.

Measurements are made by wading or from a foot plank 100 feet above the ford.

The banks of the stream are covered with brush and will overflow in extreme high water.

No reliable estimate of the daily discharge can be made, as the gage heights are somewhat uncertain and there are no measurements covering the highest gage heights during the March flood.

The yearly run-off may have been as high as 100,000 acre-feet, two-thirds of it coming in March.

Discharge measurements of Wenas Creek near Selah, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 9	McGlashan and Kimble	14	12.7	1.19	38.9
May 5	H. D. McGlashan	13	4.9	.78	6.6
Sept. 13[a]	F. B. Storey	9.5	2.7	.70	2.4
Oct. 18[a]	do	11.5	3.5	.78	4.5
Nov. 15[a]	do	13.5	7.31	.81	6.2

[a] Measurement by wading.

Daily gage height, in feet, of Wenas Creek near Selah, Wash., for 1910.

[Walter Hustead, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.3	3.3	3.4	2.1	1.3	0.5	0.7	0.3	0.6	0.9	0.8	0.9
2	1.3	3.1	8.74	2.0	1.2	.5	.7	.3	.6	.8	.8	.9
3	1.3	3.0	.....	2.0	1.2	.6	.7	.3	.6	.8	.8	.9
4	1.4	2.4	.....	1.9	1.2	.6	.7	.3	.6	.9	.8	.9
5	1.4	2.4	.....	1.9	1.2	.6	.7	.3	.6	1.1	.8	.9
6	1.4	2.4	.....	1.7	1.2	.6	.7	.3	.7	1.1	.8	.9
7	1.4	2.4	.....	1.6	1.2	.7	.7	.4	.7	1.1	.8	.9
8	1.4	2.3	.....	1.5	1.2	.7	.7	.4	.7	1.1	.8	.9
9	1.4	2.3	.....	1.2	1.1	.7	.7	.4	.7	1.1	.8	.9
10	1.4	2.2	.....	1.2	1.1	.6	.7	.4	.7	1.1	.8	.9
11	1.4	2.2	.....	1.2	1.1	.6	.6	.4	.7	1.1	.8	.9
12	1.4	2.2	.....	1.2	1.2	.6	.6	.4	.7	1.1	.8	.9
13	1.4	2.2	.....	1.2	1.2	.6	.6	.4	.7	1.1	.8	.9
14	1.4	2.2	.....	1.2	1.2	.6	.5	.5	.7	1.1	.8	.9
15	1.4	2.2	.....	1.2	1.1	.7	.5	.5	.7	1.1	.8	.9
16	1.4	2.2	.....	1.2	1.1	.7	.5	.5	.7	1.1	.8	.9
17	1.4	2.7	.....	1.15	1.0	.7	.5	.5	.7	1.1	.8	.9
18	1.4	2.75	.....	1.2	1.0	.7	.5	.5	.9	1.1	.8	.9
19	1.5	2.55	.....	1.2	1.0	.8	.5	.5	.9	1.1	.8	.9
20	1.6	3.1	4.1	1.2	1.0	.8	.5	.5	.9	1.1	.8	.9
21	1.6	3.2	4.0	1.3	1.0	.7	.4	.4	.9	1.1	.8	.9
22	1.6	3.2	3.4	1.3	.5	.7	.4	.4	.9	1.1	.8	.9
23	1.6	3.2	3.4	1.3	.5	.7	.4	.3	.9	1.2	.8	.9
24	2.0	3.15	3.3	1.2	.5	.7	.3	.4	.9	1.2	.8	.9
25	3.0	3.8	3.25	1.1	.5	.7	.3	.4	.9	1.2	.8	.9
26	3.3	3.7	3.2	1.3	.5	.7	.3	.4	.9	1.2	.8	.9
27	3.3	3.3	3.2	1.2	.5	.7	.3	.5	.9	1.2	.9	.9
28	3.4	3.3	3.2	1.3	.5	.7	.3	.4	.9	1.2	.9	.9
29	3.4	.....	3.1	1.3	.5	.7	.3	.4	.9	1.2	.9	.9
30	3.4	.....	3.1	1.3	.5	.7	.3	.5	.9	1.2	.9	.9
31	3.4	.....	3.0	.....	.5	.....	.....	.5	.....	1.2	.....	.9

NOTE.—Water rose rapidly Mar. 1 and overflowed the banks, so that the gage could not be reached until Mar. 20. Maximum stage afterwards determined by levels to have been 8.74 feet on Mar. 2. Relation between gage height and discharge probably affected by ice during January and February; observer notes ice in creek Dec. 23–31.

NACHES RIVER BASIN.

GENERAL FEATURES.

Naches River rises in the western part of Kittitas County, Wash., and flows southeastward into the Yakima above the town of North Yakima. It is about 50 miles long, and receives the drainage from a strip of the eastern slope of the Cascade Range extending from Green Pass southward for about 50 miles. It has a number of tributaries, among which are Crow Creek, Bumping River, heading in Bumping Lake, Rattlesnake Creek, Tieton River, and Cowiche Creek. Of these the Tieton is the most important. The headwater streams drain a mountainous country.

NACHES RIVER AT ANDERSON'S RANCH, NEAR NILE, WASH.

This station, which is located at Anderson's ranch, 10 miles above Nile post office, and 1 mile below the mouth of Gold Creek, was established April 24, 1909, to obtain data for power and irrigation projects, particularly in connection with the release of stored water from Bumping Lake.

Anderson's ditch diverts water from the left bank about 1 mile above the station but carries a comparatively small amount.

The gage is a vertical staff in two sections, fixed to a yellow pine tree on the left bank directly back of Anderson's house. It is 500 feet downstream from the cable from which discharge measurements are made.

The right bank is very steep and is covered with alders. The left bank is wooded and will overflow in extreme high water. The bed of the stream is of gravel and cobblestones and is liable to change during freshets. A good rating has been secured and the records may be considered excellent. The gage datum has remained unchanged.

Discharge measurements of Naches River at Anderson's ranch, near Nile, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 27	H. D. McGlashan	137	472	3.18	3,260
June 16	do	134	360	2.57	1,830
July 10	R. K. Ray	129	289	1.98	1,000
Aug. 4	McGlashan and Storey	109	162	1.25	360
Sept. 30	F. B. Storey	99	126	.98	150
Oct. 24	do	122	171	1.28	342
25	do	124	173	1.30	344

Daily gage height, in feet, of Naches River at Anderson's ranch, near Nile, Wash., for 1910.

[John Anderson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	1.85	1.35	2.5	3.0	3.2	2.0	1.3	1.0	.....	1.2	2.1
2	2.4	1.6	2.0	2.5	2.9	3.1	2.0	1.25	1.0	1.1	1.2	2.0
3	2.6	1.6	2.7	2.4	2.85	2.85	2.0	1.25	1.0	1.3	1.2	2.1
4	3.0	1.6	2.6	2.3	2.85	2.7	2.0	1.25	1.0	1.7	1.2	2.0
5	3.1	1.8	2.5	2.3	2.85	2.7	2.0	1.2	1.0	1.5	1.2	2.1
6	3.3	1.7	2.2	2.4	3.05	2.7	1.9	1.2	1.0	1.55	1.25	2.0
7	3.4	1.7	2.2	2.4	3.2	2.6	1.9	1.2	1.0	1.55	1.5	2.0
8	3.7	1.6	2.1	2.4	3.5	2.5	1.9	1.2	1.1	1.55	1.7	1.8
9	3.9	1.6	2.0	2.4	3.6	2.5	1.9	1.2	1.1	1.5	1.6	1.8
10	4.0	1.6	2.0	2.5	4.4	2.5	1.9	1.2	1.1	1.45	2.0	1.8
11	4.2	1.5	2.1	2.6	4.4	2.75	1.9	1.15	1.1	1.4	3.0	1.8
12	4.2	1.5	2.2	2.8	3.8	2.85	1.9	1.15	1.1	1.4	2.2	1.7
13	4.4	1.5	2.5	2.85	3.7	2.7	1.9	1.15	1.1	1.4	2.1	1.7
14	4.5	1.5	2.65	2.7	3.5	2.55	1.85	1.15	1.1	1.4	2.0	1.7
15	4.55	1.5	2.8	2.6	3.2	2.6	1.8	1.15	1.1	1.4	2.2	1.65
16	4.4	1.5	3.0	2.55	3.0	2.55	1.8	1.15	1.1	1.4	2.1	1.65
17	4.6	1.5	3.1	2.7	2.95	2.5	1.75	1.1	1.1	1.4	2.2	1.6
18	3.5	1.5	3.15	2.9	2.95	2.5	1.7	1.1	1.1	1.4	2.0	1.4
19	3.3	1.5	3.5	3.2	3.05	2.4	1.6	1.1	1.1	1.4	2.0	1.4
20	3.95	1.5	4.25	3.5	3.0	2.45	1.6	1.1	1.1	1.4	1.9	1.4
21	3.5	1.4	4.35	3.5	3.0	2.3	1.55	1.1	1.1	1.4	3.6	1.4
22	2.9	1.3	4.1	3.3	2.9	2.25	1.5	1.05	1.1	1.4	3.0	1.4
23	1.95	1.3	3.6	3.4	3.15	2.2	1.5	1.05	1.0	1.35	2.8	1.4
24	2.8	1.3	3.2	3.7	3.45	2.2	1.45	1.05	1.0	1.3	2.2	1.4
25	2.6	1.4	3.1	4.4	3.5	2.2	1.4	1.05	1.0	1.3	2.0	1.4
26	2.45	1.4	2.9	4.55	3.3	2.25	1.4	1.05	1.0	1.25	2.0	1.4
27	2.3	1.4	2.7	4.2	3.15	2.25	1.4	1.0	1.0	1.25	2.3	1.4
28	2.0	1.2	2.65	3.6	3.0	2.2	1.35	1.0	1.0	1.25	2.4	1.4
29	1.7	.....	2.6	3.5	2.9	1.9	1.35	1.0	1.0	1.25	2.2	1.4
30	1.85	.....	2.5	3.2	3.0	2.0	1.3	1.0	1.0	1.25	2.1	1.4
31	1.85	.....	2.5	.....	2.95	.....	1.25	1.0	.....	1.25	.....	1.4

NOTE.—River frozen Jan. 1 to 22; gage heights probably not affected by ice after the latter date.

Daily discharge, in second-feet, of Naches River at Anderson's ranch, near Nile, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	860	385	1,710	2,810	3,300	1,020	345	160	190	275	1,140
2	.....	605	1,020	1,710	2,570	3,050	1,020	310	160	215	275	1,020
3	.....	605	2,100	1,550	2,450	2,450	1,020	310	160	345	275	1,140
4	.....	605	1,890	1,410	2,450	2,100	1,020	310	160	700	275	1,020
5	.....	800	1,710	1,410	2,450	2,100	1,020	275	160	515	275	1,140
6	.....	700	1,270	1,550	2,930	2,100	910	275	160	560	310	1,020
7	.....	700	1,270	1,550	3,300	1,890	910	275	160	560	515	1,020
8	.....	605	1,140	1,550	4,080	1,710	910	275	215	560	700	800
9	.....	605	1,020	1,550	4,350	1,710	910	275	215	515	605	800
10	.....	605	1,020	1,710	6,600	1,710	910	275	215	470	1,020	800
11	.....	515	1,140	1,890	6,600	2,220	910	245	215	425	2,810	800
12	.....	515	1,270	2,330	4,900	2,450	910	245	215	425	1,270	700
13	.....	515	1,710	2,450	4,620	2,100	910	245	215	425	1,140	700
14	.....	515	2,000	2,100	4,080	1,800	860	245	215	425	1,020	700
15	.....	515	2,330	1,890	3,300	1,890	800	245	215	425	1,270	652
16	.....	515	2,810	1,800	2,810	1,800	800	245	215	425	1,140	652
17	.....	515	3,050	2,100	2,690	1,710	750	215	215	425	1,270	605
18	.....	515	3,180	2,570	2,690	1,710	700	215	215	425	1,020	425
19	.....	515	4,080	3,300	2,930	1,550	605	215	215	425	1,020	425
20	.....	515	6,160	4,080	2,810	1,630	605	215	215	425	910	425
21	.....	425	6,450	4,080	2,810	1,410	560	215	215	425	4,350	425
22	.....	345	5,740	3,550	2,570	1,340	515	188	215	425	2,810	425
23	970	345	4,350	3,810	3,180	1,270	515	188	160	385	2,330	425
24	2,330	345	3,300	4,620	3,940	1,270	470	188	160	345	1,270	425
25	1,890	425	3,050	6,600	4,080	1,270	425	188	160	345	1,020	425
26	1,630	425	2,570	7,050	3,550	1,340	425	188	160	310	1,020	425
27	1,410	425	2,100	6,020	3,180	1,340	425	160	160	310	1,410	425
28	1,020	275	2,000	4,350	2,810	1,270	385	160	160	310	1,550	425
29	700	.....	1,890	4,080	2,570	910	385	160	160	310	1,270	425
30	860	.....	1,710	3,300	2,810	1,020	345	160	160	310	1,140	425
31	860	.....	1,710	.....	2,690	.....	310	160	.....	310	.....	425

NOTE.—Daily discharge determined from a rating curve well defined below 4,000 second-feet. The flood of November, 1909, changed the channel materially, necessitating a new rating curve for 1910. Discharge Jan. 1 to 22 estimated as 400 second-feet from record of the discharge at Oak Flat, near Nile.

Monthly discharge of Naches River at Anderson's ranch, near Nile, Wash., for 1910.

[Drainage area, 391 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	2,330	400	660	1.66	1.91	40,600	C.
February	860	275	530	1.36	1.42	29,400	B.
March	6,450	385	2,430	6.22	7.17	149,000	A.
April	7,050	1,410	2,920	7.47	8.33	174,000	A.
May	6,600	2,450	3,410	8.72	10.05	210,000	A.
June	3,300	910	1,780	4.55	5.08	106,000	A.
July	1,020	310	718	1.84	2.12	44,100	A.
August	345	160	233	.596	.69	14,300	A.
September	215	160	188	.481	.54	11,200	A.
October	700	190	409	1.05	1.21	25,100	A.
November	4,350	275	1,190	3.04	3.39	70,800	A.
December	1,140	425	666	1.70	1.96	41,000	B.
The year	7,050	160	1,260	3.22	43.87	916,000	

NACHES RIVER AT OAK FLAT, NEAR NILE, WASH.

This station, which is located in sec. 34, T. 15 N., R. 16 E., at a point locally known as Oak Flat, 7 miles southeast of Nile, Wash., 2 miles above the mouth of Tieton River and one-half mile above the head gate of Selah Valley canal, was established June 25, 1904, to obtain data for use in connection with the development of the excellent power sites above the station, and the equitable distribution of stored water from Bumping Lake reservoir.

The original gage was an inclined staff on the left bank near the cable section. On April 13, 1909, the cable and gage were moved 800 feet upstream to a point affording better gaging conditions. The new gage is of the chain-and-weight type and is fastened to a cantilever beam 75 feet above the cable on the left bank. It was installed at an arbitrary datum; therefore, gage records beginning April 13, 1909, are not comparable with those made at the old station. The datum of this new chain gage has remained unchanged, although the chain was observed to have stretched considerably at times during the year and the structure to which it is attached has settled. A good rating has been obtained, but owing to the uncertainty in the gage record the results are only fair.

Discharge measurements of Naches River at Oak Flat, near Nile, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 21	McGlashan and Kimble	145	737	7.88	7,120
May 3	H. Kimble	139	462	6.30	2,880
19	Ebert and Kimble	139	546	6.70	3,830
June 17	H. D. McGlashan	136	405	5.81	2,130
July 10	R. K. Ray	123	310	5.08	1,200
Aug. 5	McGlashan and Storey	102	174	3.90	422
Sept. 17	F. B. Storey	96	137	3.44	254
Oct. 10	do	170	228	4.44	676

Daily gage height, in feet, of Naches River at Oak Flat, near Nile, Wash., for 1910.

[W. H. Johnson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.4	4.7	4.8	5.7	6.5	6.7	5.1	4.0	3.5	3.4	3.8	5.2
2	4.3	4.6	6.0	5.8	6.4	6.7	5.2	4.0	3.5	3.5	3.8	5.1
3	4.2	4.4	6.3	5.7	6.3	6.4	5.1	4.0	3.5	3.8	3.8	5.1
4	4.2	4.4	6.0	5.7	6.3	6.2	5.1	3.9	3.5	4.7	3.9	5.0
5	4.2	4.3	5.9	5.6	6.4	6.2	5.1	3.9	3.5	4.5	3.9	4.9
6	4.2	4.4	5.6	5.7	6.5	6.3	5.0	3.9	3.5	4.4	3.9	4.9
7	4.2	4.5	5.5	5.7	6.8	6.2	5.0	3.9	3.6	4.5	3.9	4.9
8	4.2	4.4	5.2	5.7	7.1	6.0	5.1	3.9	3.6	4.6	4.6	4.8
9	4.2	4.3	5.1	5.8	7.4	5.9	5.1	3.9	3.5	4.5	4.7	4.8
10	4.1	4.3	5.1	5.8	7.8	5.9	5.2	3.8	3.5	4.5	4.7	4.7
11	4.2	4.3	5.5	5.9	8.0	6.1	5.1	3.8	3.5	4.3	6.2	4.6
12	4.1	4.2	5.6	6.2	7.7	6.5	5.0	3.8	3.5	4.2	5.6	4.6
13	4.1	4.2	6.0	6.3	7.4	6.2	5.0	3.8	3.5	4.2	5.5	4.6
14	4.0	4.2	6.2	6.1	7.2	6.0	4.9	3.8	3.5	4.1	5.3	4.5
15	4.0	4.2	6.4	6.0	6.9	5.9	4.8	3.8	3.5	4.2	5.1	4.5
16	4.0	4.2	6.5	6.0	6.7	5.9	4.8	3.8	3.5	4.1	5.0	4.5
17	4.0	4.1	6.8	6.1	6.7	5.9	4.7	3.7	3.5	4.1	5.0	4.4
18	4.2	4.1	7.0	6.3	6.7	5.8	4.7	3.7	3.5	4.3	5.0	4.4
19	4.2	4.1	7.2	6.7	6.8	5.7	4.6	3.7	3.5	4.3	4.9	4.4
20	4.3	4.0	7.9	7.2	6.7	5.8	4.5	3.7	3.4	4.2	4.9	4.3
21	4.2	4.0	8.0	7.3	6.6	5.7	4.5	3.6	3.4	4.1	6.4	4.3
22	4.2	4.0	7.9	7.1	6.6	5.5	4.5	3.6	3.4	4.1	6.3	4.3
23	4.8	4.0	7.4	7.1	6.8	5.4	4.4	3.6	3.4	4.0	6.1	4.3
24	5.3	4.0	7.0	7.4	7.1	5.4	4.4	3.6	3.4	4.0	5.9	4.3
25	5.5	4.0	6.7	7.8	7.3	5.3	4.3	3.6	3.4	4.0	5.7	4.4
26	5.2	4.0	6.5	8.2	7.1	5.5	4.3	3.6	3.4	4.0	5.6	4.4
27	5.0	4.1	6.3	7.9	6.8	5.5	4.2	3.6	3.4	3.9	5.4	4.3
28	5.0	4.1	6.1	7.5	6.7	5.4	4.2	3.5	3.4	3.9	5.4	4.2
29	4.9	.....	5.9	7.1	6.5	5.2	4.2	3.5	3.4	3.9	5.3	4.2
30	4.8	.....	5.8	6.8	6.5	5.1	4.1	3.5	3.4	3.9	5.3	4.2
31	4.8	.....	5.7	.....	6.6	.....	4.1	3.5	.....	3.8	.....	4.2

NOTE.—River frozen to some extent during January; a little floating ice in February; gage heights probably not materially affected.

Daily discharge, in second-feet, of Naches River at Oak Flat, near Nile, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	654	864	944	1,980	3,410	3,840	1,230	443	268	244	363	1,340
2	594	789	2,460	2,130	3,210	3,840	1,340	443	268	268	363	1,230
3	540	654	3,010	1,980	3,010	3,210	1,230	443	268	363	363	1,230
4	540	654	2,460	1,980	3,010	2,820	1,230	400	268	864	400	1,130
5	540	594	2,290	1,840	3,210	2,820	1,230	400	268	719	400	1,030
6	540	654	1,840	1,980	3,410	3,010	1,130	400	268	654	400	1,030
7	540	719	1,700	1,980	4,070	2,820	1,130	400	295	719	400	1,030
8	540	654	1,340	1,980	4,820	2,460	1,230	400	295	789	789	944
9	540	594	1,230	2,130	5,650	2,290	1,230	400	268	719	864	944
10	490	594	1,230	2,130	6,850	2,290	1,340	363	268	719	864	864
11	540	594	1,700	2,290	7,470	2,640	1,230	363	268	594	2,820	789
12	490	540	1,840	2,820	6,540	3,410	1,130	363	268	540	1,840	789
13	490	540	2,460	3,010	5,650	2,820	1,130	363	268	540	1,700	789
14	443	540	2,820	2,640	5,090	2,460	1,030	363	268	490	1,460	719
15	443	540	3,210	2,460	4,310	2,290	944	363	268	540	1,230	719
16	443	540	3,410	2,460	3,840	2,290	944	363	268	490	1,130	719
17	443	490	4,070	2,640	3,840	2,290	864	328	268	490	1,130	654
18	540	490	4,560	3,010	3,840	2,130	864	328	268	594	1,130	654
19	540	490	5,090	3,840	4,070	1,980	789	328	268	594	1,030	654
20	594	443	7,160	5,090	3,840	2,130	719	328	244	540	1,030	594
21	540	443	7,470	5,370	3,620	1,980	719	295	244	490	3,210	594
22	540	443	7,160	4,820	3,620	1,700	719	295	244	490	3,010	594
23	944	443	5,650	4,820	4,070	1,580	654	295	244	443	2,640	594
24	1,460	443	4,560	5,650	4,820	1,580	654	295	244	443	2,290	594
25	1,700	443	3,840	6,850	5,370	1,460	594	295	244	443	1,980	654
26	1,340	443	3,410	8,100	4,820	1,700	594	295	244	443	1,840	654
27	1,130	490	3,010	7,160	4,070	1,700	540	295	244	400	1,580	594
28	1,130	490	2,640	5,940	3,840	1,580	540	268	244	400	1,580	540
29	1,030	.....	2,290	4,820	3,410	1,340	540	268	244	400	1,460	540
30	944	.....	2,130	4,070	3,410	1,230	490	268	244	400	1,460	540
31	944	.....	1,980	.....	3,620	.....	490	268	.....	363		540

NOTE.—Daily discharge determined from a rating curve, well defined throughout.

Monthly discharge of Naches River at Oak Flat, near Nile, Wash., for 1910.

[Drainage area, 636 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	1,700	443	716	1.13	1.30	44,000	B.
February	864	443	558	.877	.91	31,000	B.
March	7,470	944	3,190	5.02	5.79	196,000	B.
April	8,100	1,840	3,600	5.66	6.32	214,000	B.
May	7,470	3,010	4,320	6.79	7.83	266,000	B.
June	3,840	1,230	2,320	3.65	4.07	138,000	B.
July	1,340	490	919	1.44	1.66	56,500	B.
August	443	268	346	.544	.63	21,300	B.
September	295	244	261	.410	.46	15,500	B.
October	864	244	522	.821	.95	32,100	B.
November	3,210	363	1,360	2.14	2.39	80,900	B.
December	1,340	540	784	1.23	1.42	48,200	B.
The year	8,100	244	1,580	2.48	33.73	1,140,000	

NACHES RIVER BELOW TIETON RIVER, NEAR NACHES, WASH.

This station, which is located in sec. 35, T. 15 N., R. 16 E., 5 miles above Naches, Wash., 600 feet below the mouth of Tieton River, 600 feet above the head-gate of the Wapatox power canal and 500 feet above a waste from the Selah Valley canal, was established August 4, 1905, and used as a temporary station during the low-water period of 1905. On March 16, 1909, the station was reestablished and equipment installed for making measurements at all stages, in order to obtain data to check the records of the station at Oak Flat on Naches River and at Cobb's ranch on Tieton River. The sum of the discharges at these two stations should equal the sum of those measured at the station below the Tieton and on the Selah Valley canal, plus whatever water is spilled at the wasteway of the canal above the station on the canal and below that on the river. This wasteway is thus omitted from the measurements but it is believed to have been only very small in amount in 1910.

The gage is in two sections—an inclined gage on the left bank in the measuring section, which reads 7.3 feet, and a vertical staff which reads from 7.3 to 16 feet. Measurements are made from a cable.

The right bank of the stream is rather low, is wooded, and is subject to overflow at high stages. The left bank is high, rocky, and will not overflow. The bed of the stream is of gravel and cobblestones, but will change during freshets. Ice is not likely to affect this station except in unusually cold weather.

The record for 1910 is good, except for a little uncertainty during the spring high-water period.

Discharge measurements of Naches River below Tieton River, near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 28	H. Kimble	115	394	2.55	751
Mar. 5	do	155	704	4.80	3,980
21	do	213	1,110	7.00	10,000
May 19	Kimble and Ebert	166	749	5.40	4,840
June 17	H. D. McGlashan	144	621	4.40	2,960
July 10	R. K. Ray	117	501	3.52	1,740
Aug. 9	H. Kimble	112	364	2.30	627
Sept. 17	F. B. Storey	108	324	1.93	430
Oct. 24	do	112	362	2.25	598
Nov. 23	H. Kimble	156	692	4.75	3,390
28	F. B. Storey	125	548	3.72	2,000

Daily gage height, in feet, of Naches River below Tieton River, near Naches, Wash., for 1910.

[W. H. Johnson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.7	3.4	3.0	4.6	5.4	5.7	3.6	2.4	1.9	2.0	2.3	4.0
2	2.6	3.3	4.0	4.7	5.3	5.8	3.6	2.4	1.9	2.2	2.3	3.8
3	2.6	3.1	5.5	4.5	5.1	5.5	3.6	2.4	1.9	2.8	2.3	3.6
4	2.6	3.0	5.4	4.5	5.1	5.2	3.6	2.3	1.9	3.6	2.3	3.5
5	2.6	2.9	4.9	4.4	5.2	5.1	3.5	2.3	1.8	3.2	2.3	3.4
6	2.5	3.0	5.0	4.4	5.3	5.1	3.5	2.3	1.8	3.2	2.2	3.4
7	2.5	3.0	4.7	4.5	5.6	4.9	3.5	2.3	1.8	3.3	2.3	3.3
8	2.5	2.9	4.4	4.6	6.2	4.7	3.6	2.3	1.8	3.4	3.2	3.3
9	2.5	2.9	4.2	4.6	6.5	4.6	3.6	2.3	1.8	3.0	3.3	3.2
10	2.5	2.9	4.1	4.7	6.9	4.5	3.6	2.2	1.7	2.8	3.3	3.2
11	2.5	2.8	4.3	4.7	7.1	4.7	3.5	2.2	1.7	2.7	5.5	3.1
12	2.5	2.8	4.5	5.0	6.6	5.2	3.6	2.2	1.7	2.7	5.0	3.1
13	2.4	2.8	4.8	5.2	6.3	4.9	3.5	2.2	1.7	2.6	4.6	3.0
14	2.4	2.8	5.2	5.0	6.1	4.7	3.4	2.2	1.7	2.5	4.1	3.0
15	2.4	2.7	5.5	4.8	5.7	4.6	3.3	2.1	1.7	2.5	3.7	3.0
16	2.4	2.7	5.7	4.7	5.5	4.5	3.3	2.1	1.7	2.4	3.6	2.9
17	2.4	2.7	6.0	4.8	5.4	4.5	3.2	2.1	1.7	2.4	3.5	2.9
18	2.5	2.7	6.1	5.0	5.3	4.4	3.1	2.1	1.7	2.5	3.4	2.8
19	2.5	2.6	6.5	5.4	5.5	4.5	3.0	2.1	1.7	2.6	3.3	2.8
20	2.5	2.6	7.1	6.2	5.4	4.4	3.0	2.1	1.7	2.6	3.3	2.8
21	2.5	2.6	7.3	6.1	5.3	4.2	3.0	2.0	1.8	2.5	5.6	2.7
22	2.5	2.5	6.9	6.0	5.3	4.0	3.0	2.0	2.0	2.5	5.5	2.7
23	3.4	2.5	6.5	6.1	5.5	3.9	2.9	2.0	2.0	2.4	5.3	2.7
24	3.9	2.6	6.2	6.5	5.8	3.8	2.8	2.0	2.0	2.5	5.2	2.6
25	4.0	2.6	5.8	6.9	6.2	3.7	2.7	2.0	2.0	2.6	5.1	2.6
26	3.9	2.6	5.6	6.7	5.9	3.9	2.7	2.0	2.0	2.6	5.0	2.7
27	3.7	2.7	5.3	6.6	5.7	4.0	2.6	2.0	2.0	2.5	4.8	2.7
28	3.6	2.7	5.1	6.4	5.6	3.9	2.6	2.0	2.0	2.4	4.5	2.7
29	3.5	.....	4.9	6.0	5.4	3.7	2.5	1.9	2.0	2.4	4.3	2.7
30	3.5	.....	4.7	5.8	5.3	3.6	2.5	1.9	2.0	2.4	4.2	2.6
31	3.5	.....	4.6	.....	5.4	.....	2.5	1.9	.....	2.3	.....	2.6

NOTE.—River partly frozen over about Jan. 5 to 27; a little slush ice running toward the end of February; gage heights probably not materially affected. The gage readings at this station are subject to some uncertainty.

Daily discharge, in second-feet, of Naches River below Tieton River, near Naches, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	890	1,570	1,140	3,030	4,830	5,600	1,830	680	418	465	620	2,420
2	815	1,450	2,420	3,230	4,580	5,870	1,830	680	418	565	620	2,100
3	815	1,240	5,730	2,840	4,110	5,080	1,830	680	418	970	620	1,830
4	815	1,140	5,460	2,840	4,110	4,340	1,830	620	418	1,830	620	1,700
5	815	1,060	4,230	2,670	4,340	4,110	1,700	620	383	1,340	620	1,570
6	740	1,140	3,880	2,670	4,580	4,110	1,700	620	383	1,340	565	1,570
7	740	1,140	3,230	2,840	5,340	3,650	1,700	620	383	1,450	620	1,450
8	740	1,060	2,670	3,030	6,970	3,230	1,830	620	383	1,570	1,340	1,450
9	740	1,060	2,330	3,030	7,820	3,350	1,830	620	383	1,140	1,450	1,340
10	740	1,060	2,180	3,230	9,000	3,150	1,830	565	360	970	1,450	1,340
11	740	970	2,500	3,230	9,600	3,570	1,700	565	360	890	5,730	1,240
12	740	970	2,840	3,880	8,110	4,750	1,830	565	360	890	4,470	1,240
13	680	970	3,440	4,340	7,250	4,030	1,700	565	360	815	3,530	1,140
14	680	970	4,340	3,880	6,690	3,570	1,570	565	360	740	2,580	1,140
15	680	890	5,080	3,440	5,600	3,350	1,450	515	360	740	1,960	1,140
16	680	890	5,600	3,230	5,080	3,150	1,450	515	360	680	1,830	1,060
17	680	890	6,410	3,440	4,830	3,150	1,340	515	360	680	1,700	1,060
18	740	890	6,690	3,880	4,580	2,960	1,240	515	360	740	1,570	970
19	740	815	7,820	4,830	5,080	3,150	1,140	515	360	815	1,450	970
20	740	815	9,600	6,970	4,830	2,960	1,140	515	360	815	1,450	970
21	740	815	10,200	6,690	4,580	2,600	1,140	465	383	740	6,000	890
22	740	740	9,000	6,410	4,580	2,270	1,140	465	465	740	5,730	890
23	1,570	740	7,820	6,690	5,080	2,110	1,060	465	465	680	5,200	890
24	2,260	815	6,970	7,820	5,870	1,970	970	465	465	740	4,950	815
25	2,420	815	5,870	9,000	6,970	1,840	890	465	465	815	4,710	815
26	2,260	815	5,340	8,400	6,140	2,110	890	465	465	815	4,470	890
27	1,960	890	4,580	8,110	5,600	2,270	815	465	465	740	3,990	890
28	1,830	890	4,110	7,530	5,340	2,260	815	465	465	680	3,330	890
29	1,700	.....	3,650	6,410	4,830	1,960	740	418	465	680	2,930	890
30	1,700	.....	3,230	5,870	4,580	1,830	740	418	465	680	2,750	815
31	1,700	.....	3,030	.....	4,830	.....	740	418	.....	620	.....	815

NOTE.—Daily discharge Jan. 1 to Mar. 5 and June 28 to Dec. 31 determined from a well-defined rating curve. Discharge Mar. 6 to June 27 determined from two curves, each fairly defined by one measurement, and from comparison with the discharge of Naches River at Oak Flat and Tieton River at Cobb's ranch, less the amount diverted between the stations by the Selah Valley canal.

Monthly discharge of Naches River below Tieton River, near Naches, Wash., for 1910.

[Drainage area, 930 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	2,420	680	1,090	1.17	1.35	67,000	B.
February	1,570	740	983	1.06	1.10	54,600	B.
March	10,200	1,140	4,880	5.25	6.05	300,000	B.
April	9,000	2,670	4,780	5.14	5.74	284,000	B.
May	9,600	4,110	5,670	6.10	7.03	349,000	B.
June	5,870	1,830	3,280	3.53	3.94	195,000	B.
July	1,830	740	1,370	1.47	1.70	84,200	B.
August	680	418	537	.577	.67	33,000	B.
September	465	360	404	.434	.48	24,000	B.
October	1,830	465	883	.95	1.10	54,300	B.
November	6,000	565	2,630	2.83	3.16	156,000	B.
December	2,420	815	1,200	1.29	1.49	73,800	B.
The year	10,200	360	2,310	2.48	33.81	1,670,000	

NACHES RIVER AT NORTH YAKIMA, WASH.

This station, which is located in sec. 12, T. 13 N., R. 18 E., near the mouth of Naches River at North Yakima, Wash., was established August 14, 1903, and has been maintained continuously since that date, except during intervals when gages and gaging equipment were put out of commission by floods.

The drainage area is 1,120 square miles. The entire flow of the river during the summer months is diverted for irrigation in the the Naches and Yakima valleys. The station is located below the lowest diversion for irrigation. The North Yakima power canal, however, diverts 80 to 200 second-feet past the station continuously, a portion of which is wasted into Yakima River, as represented by the stations on the North Yakima power waste, Mill waste, and also the Naches Avenue Union canal during the nonirrigating season.

Gages have been maintained below the Northern Pacific Railway bridge and on the highway bridge at North Yakima, and on the cribwork which extends as a protection for the approach to the railroad bridge on the right bank. The present site of the station was selected June 18, 1908, when a chain gage was installed on the right bank, 800 feet above the railroad bridge. This gage was destroyed October 3, 1909. Gage heights from October 12 to 25, 1909, were observed on a temporary staff gage and reduced to the datum of the chain gage. A new chain gage was installed October 26, 1909, at the same place and datum. The datum of these chain gages bears no determined relation to that of the earlier gages.

At first measurements were made at the railroad bridge; later from the highway bridge 200 feet above the railroad bridge, and still later from a cable installed between the two bridges. Discharge measurements are now made from a long cable reaching from the high bluff on the left bank to an artificial dike on the right bank.

In the vicinity of North Yakima the river bed is composed of gravel and cobblestones and during heavy floods changes so materially that a new rating curve is required after each high-water period. At the present site of the gage conditions are such that a good rating curve can be developed for all ordinary and medium stages. During the winter months ice jams frequently occur at the railroad bridge and interfere with the determination of flow to a considerable extent.

A good rating curve has been made and the record as a whole may be considered good.

Discharge measurements of Naches River at North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 1	H. Kimble	180	419	4.56	656
3	do	266	970	7.43	6,420
19	C. F. Gleason	278	1,140	8.06	8,380
20	Gleason and Kimble	350	1,380	8.53	11,000
May 25	McGlashan and Ebert	271	1,020	7.65	6,840
July 20	Kimble and Gilkey	178	373	4.60	675
Aug. 1	McGlashan and Storey	170	318	4.21	405
24	H. D. McGlashan	161	190	3.41	93
Oct. 8	F. B. Storey	179	450	4.90	1,070
20	do	174	369	4.48	624

Daily gage height, in feet, of Naches River at North Yakima, Wash., for 1910.

[Mrs. I. J. Oder, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.8	5.1	6.55	6.2	6.85	6.7	5.3	4.2	3.35	3.6	4.2	5.2
2	4.65	5.05	7.5	6.15	6.8	6.6	5.2	4.2	3.35	3.6	4.2	5.15
3	4.6	5.0	7.5	6.15	6.65	6.35	5.2	4.2	3.4	3.6	4.25	5.15
4	4.6	4.9	7.05	6.15	6.65	6.3	5.15	4.0	3.5	5.3	4.3	5.0
5	4.65	4.9	6.8	6.10	6.65	6.3	5.1	4.0	3.5	5.3	4.4	5.25
6	4.7	4.85	6.75	6.05	6.65	6.3	5.1	4.0	3.4	5.3	4.6	5.3
7	4.8	4.85	6.55	6.05	6.85	6.1	5.1	4.0	3.35	4.95	4.85	5.0
8	4.8	4.8	6.5	6.05	7.45	6.0	5.1	4.0	3.35	4.8	5.0	5.0
9	4.7	4.75	6.3	6.0	7.7	5.8	5.1	4.0	3.3	4.9	5.2	4.95
10	4.65	4.8	6.1	6.15	8.25	5.6	5.2	4.0	3.3	4.85	5.2	4.9
11	4.6	4.7	6.1	6.25	8.15	7.0	5.2	4.15	3.3	4.8	5.4	4.8
12	4.55	4.7	6.2	6.4	7.85	6.8	5.1	4.05	3.4	4.7	5.4	4.8
13	4.55	4.65	6.5	6.55	7.45	6.5	5.1	4.0	3.4	4.6	5.95	4.85
14	4.55	4.65	6.75	6.55	7.25	6.4	5.1	3.9	3.4	4.5	5.65	4.85
15	4.5	4.6	6.85	6.35	6.95	6.3	5.1	3.85	3.4	4.4	5.5	4.85
16	4.5	4.55	7.2	6.4	6.85	6.1	5.0	3.8	3.45	4.4	5.3	4.8
17	4.5	4.5	7.55	6.75	6.85	5.9	5.0	3.7	3.45	4.4	5.3	4.8
18	4.35	4.45	7.75	6.85	6.85	5.9	4.95	3.65	3.45	4.6	5.55	4.75
19	4.3	4.4	8.0	7.05	6.85	5.75	4.9	3.65	3.4	4.55	5.8	4.75
20	4.3	4.4	8.55	7.05	6.85	5.7	4.8	3.65	3.4	4.5	6.25	4.7
21	4.3	4.35	8.1	7.25	6.85	5.7	4.65	3.6	3.45	4.45	7.2	4.7
22	4.7	4.35	7.7	7.45	6.95	5.7	4.55	3.6	3.5	4.4	7.0	4.7
23	5.0	4.35	7.3	7.65	7.05	5.6	4.5	3.6	3.5	4.4	6.5	4.65
24	5.95	4.4	7.1	7.75	7.35	5.5	4.5	3.6	3.5	4.35	6.2	4.65
25	5.8	4.4	6.8	8.35	7.8	5.5	4.4	3.5	3.5	4.35	5.7	4.65
26	5.65	4.45	6.7	8.50	7.55	5.5	4.3	3.5	3.55	4.4	5.5	4.65
37	5.65	4.75	6.6	8.05	7.0	5.5	4.25	3.45	3.55	4.4	5.4	4.6
38	5.5	4.9	6.4	7.75	6.9	5.45	4.2	3.4	3.55	4.4	5.65	4.5
29	5.35	.....	6.4	7.35	6.9	5.4	4.0	3.4	3.6	4.4	5.7	4.5
20	5.3	.....	6.3	7.15	6.8	5.3	3.9	3.4	3.6	4.35	5.5	4.45
21	5.2	.....	6.25	.....	6.8	.....	3.95	3.4	.....	4.3	.....	4.4

NOTE.—No ice reported at this station. Gage readings not exceptionally good.

Daily discharge, in second-feet, of Naches River at North Yakima, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	890	1,220	3,520	2,840	4,230	3,860	1,480	430	82	145	430	1,350
2	752	1,160	6,230	2,760	4,100	3,630	1,350	430	82	145	430	1,280
3	708	1,100	6,230	2,760	3,740	3,120	1,350	430	91	145	461	1,280
4	708	995	4,780	2,760	3,740	3,020	1,280	319	115	1,480	492	1,100
5	752	995	4,100	2,670	3,740	3,020	1,220	319	115	1,480	560	1,420
6	793	942	3,980	2,580	3,740	3,020	1,220	319	91	1,480	708	1,480
7	890	942	3,520	2,580	4,230	2,670	1,220	319	82	1,050	942	1,100
8	890	890	3,420	2,580	6,060	2,500	1,220	319	82	890	1,100	1,100
9	793	842	3,020	2,500	7,020	2,190	1,220	319	72	995	1,350	1,050
10	752	890	2,670	2,760	9,500	1,900	1,350	319	72	942	1,350	995
11	708	793	2,670	2,930	9,020	4,630	1,350	402	72	890	1,620	890
12	670	793	2,840	3,220	7,660	4,100	1,220	346	91	793	1,620	890
13	670	752	3,420	3,520	6,060	3,420	1,220	319	91	708	2,420	942
14	670	752	3,980	3,520	5,390	3,220	1,220	268	91	633	1,970	942
15	633	708	4,230	3,120	4,500	3,020	1,220	244	91	560	1,760	942
16	633	670	5,230	3,220	4,230	2,670	1,100	220	103	560	1,480	890
17	633	633	6,420	3,980	4,230	2,340	1,100	180	103	560	1,480	890
18	526	596	7,230	4,230	4,230	2,340	1,050	162	103	708	1,830	842
19	492	560	8,330	4,780	4,230	2,120	995	162	91	670	2,190	842
20	492	560	11,100	4,780	4,230	2,040	890	162	91	633	2,930	793
21	492	526	8,790	5,390	4,230	2,040	750	145	103	596	5,230	793
22	793	526	7,020	6,060	4,500	2,040	670	145	115	560	4,630	793
23	1,100	526	5,550	6,820	4,780	1,900	633	145	115	560	3,420	750
24	2,420	560	4,920	7,230	5,720	1,760	633	145	115	526	2,840	750
25	2,190	560	4,100	10,000	7,440	1,760	560	115	115	526	2,040	750
26	1,970	596	3,860	10,800	6,420	1,760	492	115	130	560	1,760	750
27	1,970	842	3,630	8,560	4,630	1,760	461	103	130	560	1,620	708
28	1,760	995	3,220	7,230	4,360	1,690	430	91	130	560	1,970	633
29	1,550	.....	3,220	5,720	4,360	1,620	319	91	145	560	2,040	633
30	1,480	.....	3,020	5,080	4,100	1,480	268	91	145	526	1,760	596
31	1,350	.....	2,930	.....	4,100	.....	294	91	.....	492	.....	560

NOTE.—Daily discharge determined from a rating curve well defined throughout. The accuracy of the estimates, is, however. reduced by the uncertainties of the gage-height record.

Monthly discharge of Naches River at North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	2,420	492	1,000	61,500	B.
February	1,220	526	783	43,500	B.
March	11,100	2,670	4,750	292,000	B.
April	10,800	2,500	4,570	272,000	B.
May	9,500	3,740	5,110	314,000	B.
June	4,630	1,480	2,550	152,000	B.
July	1,480	268	961	59,100	B.
August	430	91	234	14,400	A.
September	145	72	102	6,070	A.
October	1,480	145	693	42,600	B.
November	5,230	430	1,810	108,000	B.
December	1,480	560	927	57,000	B.
The year	11,100	72	1,960	1,420,000	

BUMPING RIVER BASIN.

GENERAL FEATURES.

Bumping River rises in Fish Lake near Carlton Pass at an altitude of about 4,300 feet above sea level and flows northeastward about 10 miles to Bumping Lake (altitude about 3,400 feet above sea level); thence it flows northeastward about 15 miles to its junction with Naches River. About 4 miles above its mouth it receives its principal tributary, American River, a stream which heads on the high divide of the Cascade Range and flows northeastward. The area drained by American River is heavily forested and its flow is supplied largely by snow banks.

Bumping Lake is to be used as a storage reservoir, from which water will be released to replace in the lower Naches River water diverted from the Tieton River for the Tieton project.

BUMPING LAKE NEAR NILE, WASH.

A vertical staff gage was installed on the north shore of Bumping Lake about one-fourth mile above the outlet April 27, 1909, to obtain data for use in connection with the operation of the storage reservoir. When surveys of the lake have been completed it will be possible to develop a storage table similar to that for the lakes at the headwaters of Yakima River, to be used in connection with the station on Bumping River to determine the natural flow of the river.

No readings were made between November 22, 1909, and November 3, 1910.

Daily gage height, in feet, of Bumping Lake near Nile, Wash., for 1910.

[R. T. O'Hagan, observer.]

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1	.....	99.92	11	101.48	97.27	21	101.33	93.30
2	.....	99.72	12	102.03	96.70	22	103.38	93.35
3	95.28	99.10	13	102.28	96.20	23	102.98	93.55
4	95.73	99.28	14	102.08	95.45	24	104.10	93.62
5	95.83	99.00	15	101.38	95.10	25	104.00	93.47
6	95.73	98.84	16	101.33	94.95	26	103.55	93.42
7	95.88	98.82	17	100.53	94.35	27	102.05	93.38
8	96.58	98.87	18	100.33	93.95	28	102.02	93.32
9	96.73	97.65	19	98.98	93.65	29	101.10	93.32
10	100.73	97.32	20	99.35	93.42	30	100.05	93.30
						31	.....	93.27

NOTE.—Add 3,300 feet for sea-level datum.

BUMPING RIVER AT BUMPING LAKE, NEAR NILE, WASH.

This station, which is located 1,200 feet below the site of the Bumping Lake storage dam, 100 feet below the end of the spillway, was first established June 13, 1906, at a point about 600 feet below the outlet of Bumping Lake, but records were not kept continuously, except for a short period in 1906, until it was reestablished at the present site July 3, 1909.

Two gages were installed, one on the bridge at the dam site and the other at the cable section 1,200 feet below. Simultaneous observations have been obtained, and all gage heights are referred to the cable gage.

The right bank of the stream is heavily wooded and is overflowed at a gage height of 5 feet. The left bank is nearly vertical to a point above high water and is heavily timbered. The bed of the stream is of coarse gravel and cobblestones and is fairly permanent. There is a riffle control 200 feet below the station.

A good rating curve has been constructed, and the records may be considered good.

Discharge measurements of Bumping River at Bumping Lake, near Nile, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 27	H. D. McGlashan	71	264	[a] 4.60	1,320
July 9	R. K. Ray	61	161	3.06	378
Aug. 3	H. D. McGlashan	43	104	2.09	114
Sept. 29	F. B. Storey	51	87	1.70	50.4

[a] Bridge gage reading 4.50 feet.

Daily gage height, in feet, of Bumping River at Bumping Lake, near Nile, Wash., for 1910.

[R. H. Hayden observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.45	2.65	.....	2.80	3.62	4.45	2.80	2.20	1.70	1.80	2.50	2.68
2	2.45	2.60	3.40	2.80	3.52	4.78	2.85	2.15	1.70	1.85	1.90	2.60
3	2.45	2.55	3.62	2.70	3.42	4.15	2.90	2.15	1.70	2.28	2.30	2.75
4	2.40	2.50	3.40	2.70	3.40	3.85	2.90	2.20	1.75	2.50	2.25	2.98
5	2.40	2.45	3.20	2.75	3.40	3.85	2.95	2.20	1.80	2.60	2.20	2.98
6	2.40	2.45	2.95	2.70	3.58	3.85	2.90	2.15	1.90	2.80	2.30	2.92
7	2.35	2.40	2.90	2.70	3.90	3.78	2.90	2.10	1.85	2.80	2.75	3.05
8	2.35	2.35	2.70	2.70	4.45	3.62	3.00	2.10	1.85	2.80	2.75	2.98
9	2.40	2.35	2.60	2.70	4.55	3.52	3.10	2.10	1.85	2.80	2.80	2.88
10	2.40	2.30	2.50	2.72	5.10	3.58	3.05	2.05	1.80	2.70	3.25	2.80
11	2.40	2.30	2.40	2.80	5.55	4.10	3.00	2.00	2.00	2.60	3.22	2.72
12	2.35	2.30	2.35	2.82	4.92	4.05	3.00	2.00	2.00	2.50	2.80	2.65
13	2.30	2.30	2.40	2.90	4.65	3.88	2.95	1.95	1.90	2.40	3.55	2.82
14	2.30	2.30	2.50	2.81	4.35	3.78	2.90	1.95	1.85	2.40	3.55	2.85
15	2.30	2.25	2.65	2.72	4.12	3.68	2.90	1.90	1.85	2.80	3.55	2.78
16	2.30	2.25	2.70	2.82	3.92	3.68	2.85	1.90	1.80	2.70	3.40	2.72
17	2.30	2.20	2.82	2.95	3.85	3.58	2.75	1.90	1.75	2.60	3.35	2.80
18	2.30	2.20	3.02	3.30	4.08	3.45	2.70	1.90	1.75	2.55	3.20	2.70
19	2.35	2.20	3.35	3.48	4.12	3.45	2.60	1.90	1.70	2.50	3.15	2.52
20	2.35	2.20	3.75	3.85	3.95	3.60	2.55	1.90	1.75	2.50	3.50	2.42
21	2.85	2.20	3.90	4.02	3.92	3.45	2.50	1.90	1.70	2.40	3.48	2.38
22	2.90	2.20	3.90	3.92	4.00	3.40	2.45	1.85	1.70	2.40	4.05	2.38
23	3.05	2.20	3.78	3.98	4.35	3.35	2.45	1.80	1.65	2.35	4.02	2.55
24	3.10	2.20	3.70	4.22	4.75	3.20	2.40	1.75	1.60	2.30	4.05	2.52
25	3.30	2.20	3.60	4.48	4.85	3.25	2.30	1.70	1.65	2.30	4.05	2.50
26	3.30	2.20	3.45	4.88	4.60	3.38	2.25	1.70	1.65	2.30	3.98	2.45
27	3.20	.....	3.25	4.75	4.42	3.28	2.20	1.70	1.65	2.30	3.05	2.38
28	3.00	.....	3.05	4.35	4.18	3.20	2.20	1.70	1.65	2.30	3.12	2.35
29	2.90	.....	2.95	4.05	4.12	2.80	2.20	1.75	1.70	2.30	3.05	2.32
30	2.80	.....	2.90	3.82	4.12	2.80	2.20	1.75	1.75	2.25	2.82	2.30
31	2.80	.....	2.80	.....	4.22	.....	2.20	1.75	.....	2.25	.....	2.28

NOTE.—Probably no ice at this station as it is just below the outlet of the lake.

Daily discharge, in second-feet, of Bumping River at Bumping Lake, near Nile, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	197	254	0	300	646	1,200	300	137	50	64	210	263
2	197	238	534	300	594	1,460	316	126	50	72	79	238
3	197	224	646	269	544	975	333	126	50	155	159	284
4	184	210	534	269	534	780	333	137	57	210	148	359
5	184	197	442	284	534	780	350	137	64	238	137	359
6	184	197	350	269	625	780	333	126	79	300	159	340
7	172	184	333	269	810	738	333	116	72	300	284	383
8	172	172	269	269	1,200	646	366	116	72	300	284	359
9	184	172	238	269	1,280	594	400	116	72	300	300	326
10	184	159	210	275	1,750	625	383	106	64	269	464	300
11	184	159	184	300	2,170	940	366	96	96	238	451	275
12	172	159	172	307	1,590	908	366	96	96	210	300	127
13	159	159	184	333	1,360	798	350	88	79	184	610	307
14	159	159	210	303	1,120	738	333	88	72	184	610	316
15	159	148	254	275	954	679	333	79	72	300	610	294
16	159	148	269	307	823	679	316	79	64	269	534	275
17	159	137	307	350	780	625	284	79	57	238	559	300
18	159	137	373	485	927	559	269	79	57	224	442	269
19	172	137	510	574	954	559	238	79	50	210	421	216
20	172	137	720	780	842	635	224	79	57	210	584	189
21	316	137	810	888	823	559	210	79	50	184	574	179
22	333	137	810	823	875	534	197	72	50	184	908	179
23	383	137	738	862	1,120	510	197	64	44	172	888	224
24	400	137	690	1,020	1,440	442	184	57	39	159	908	216
25	485	137	635	1,220	1,520	464	159	50	44	159	908	210
26	485	137	559	1,550	1,320	524	148	50	44	159	862	197
27	442	0	464	1,440	1,180	476	137	50	44	159	383	179
28	366	0	383	1,120	996	442	137	50	44	159	408	172
29	333	.....	350	908	954	300	137	57	50	159	383	164
30	300	.....	333	762	954	300	137	57	57	148	307	159
31	300	.....	300	.....	1,020	.....	137	57	.....	148	.....	155

NOTE.—Daily discharge determined from a rating curve well defined below 1,500 second-feet. Discharge for Dec. 12 is reduced as the gates in the dam were closed half a day. The river was dammed up at the lake by a snow slide Feb. 27 to Mar. 1 and no water was flowing.

Monthly discharge of Bumping River at Bumping Lake, near Nile, Wash., for 1910.

[Drainage area, 68 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	485	159	247	3.63	4.18	15,200	A.
February	254	0	154	2.26	2.35	8,550	A.
March	810	0	414	6.09	7.02	25,500	A.
April	1,550	269	579	8.51	9.50	34,500	A.
May	2,170	534	1,040	15.3	17.64	64,000	B.
June	1,460	300	675	9.93	11.08	40,200	A.
July	400	137	268	3.94	4.54	16,500	A.
August	137	50	88.0	1.29	1.49	5,410	A.
September	96	39	59.9	.881	.98	3,560	A.
October	300	64	202	2.96	3.41	12,400	A.
November	908	79	462	6.79	7.58	27,500	A.
December	383	127	252	3.71	4.28	15,500	A.
The year	2,170	0	371	5.46	74.05	269,000	

AMERICAN RIVER NEAR NILE, WASH.

The station, which is located at a highway bridge three-fourths of a mile above the mouth of American River, 35 miles above Naches and 20½ miles above Nile, was established April 25, 1909.

The gage is a vertical staff fixed on the right abutment of the bridge from which measurements are made. On account of the isolation of the station it is practically impossible to obtain continuous observations.

The right bank is high and wooded and will not overflow. The left bank is low and will overflow in extreme flood. The bed of the stream is composed of gravel and cobblestones and is fairly permanent.

The pier to which the gage is attached has settled slightly so that the gage datum for 1910 is slightly lower than that of the previous year. As the channel has changed materially since 1909 a new rating curve for 1910 was necessary and no attempt was made to reduce gage observations for 1910 to the 1909 datum.

The records may be considered good.

Discharge measurements of American River near Nile, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 27	H. D. McGlashan	57	164	3.65	899
July 10	R. K. Ray	55	110	2.79	368
Aug. 4	McGlashan and Storey	57	76	1.98	135
18	R. H. Bolster	51	63	1.82	93
Sept. 29	F. B. Storey	56	52	1.59	56

Daily gage height, in feet, of American River near Nile, Wash., for 1910.

[Lee Greer, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	3.72	2.75	2.00	1.71	1.62	1.75
2	.....	3.55	2.70	2.00	1.70	2.75	1.75
3	.....	3.23	2.70	1.98	1.70	2.86	1.9
4	.....	3.15	2.75	1.95	1.69	2.68	1.8
5	.....	3.18	2.65	1.95	1.69	2.65	1.8
6	.....	3.32	2.55	1.93	1.68	2.5	1.9
7	.....	3.18	2.75	1.92	1.67	2.45	1.9
8	.....	3.03	2.82	1.90	1.66	2.35	2.4
9	.....	2.98	2.90	1.90	1.65	2.3	2.8
10	.....	3.08	2.85	1.90	1.65	2.2	3.5
11	.....	3.45	2.78	1.90	1.64	2.8	4.0
12	.....	3.58	2.72	1.90	1.64	2.0	3.2
13	.....	3.20	2.70	1.90	1.63	2.0	2.8
14	.....	3.08	2.60	1.88	1.62	1.93	2.7
15	.....	3.18	2.50	1.85	1.61	1.9	2.5
16	.....	3.07	2.47	1.84	1.62	1.88	.....
17	.....	3.02	2.43	1.83	1.62	1.80	.....
18	.....	2.90	2.40	1.82	1.62	2.25	.....
19	.....	2.98	2.35	1.81	1.62	2.0	.....
20	.....	3.00	2.30	1.80	1.61	1.95	.....
21	.....	2.86	2.28	1.80	1.61	1.9	.....
22	.....	2.75	2.25	1.79	1.61	1.9	.....
23	.....	2.68	2.20	1.79	1.60	1.88	.....
24	.....	2.72	2.20	1.78	1.60	1.85	.....
25	.....	2.80	2.18	1.76	1.60	1.85	.....
26	3.7	.....	2.15	1.74	1.60	1.95	.....
27	3.65	.....	2.10	1.73	1.58	1.9	.....
28	3.45	.....	2.80	1.73	1.59	1.85	.....
29	3.38	.....	2.50	1.72	1.59	1.8	.....
30	3.4	.....	2.30	1.72	1.60	1.8	.....
31	3.5	.....	2.00	1.71	.....	1.78	.....

Daily discharge, in second-feet, of American River near Nile, Wash., for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	969	374	130	75	60	82	16	.....	541	266	98	60	105	.....
2	.....	850	352	130	73	374	82	17	.....	512	252	95	60	107	.....
3	.....	637	352	126	73	352	109	18	.....	446	241	94	60	195	.....
4	.....	588	378	120	71	344	90	19	.....	489	226	92	60	130	.....
5	.....	606	332	120	71	332	90	20	.....	500	210	90	59	120	.....
6	.....	695	294	115	70	276	109	21	.....	426	204	90	59	109	.....
7	.....	606	374	113	68	258	109	22	.....	374	195	88	59	109	.....
8	.....	517	406	109	67	230	241	23	.....	344	180	88	57	105	.....
9	.....	489	446	109	65	210	396	24	.....	361	180	87	57	100	.....
10	.....	546	421	109	65	180	816	25	.....	396	175	83	57	100	.....
11	.....	782	387	109	63	396	1,180	26	955	392	167	80	57	120	.....
12	.....	871	361	109	63	130	618	27	920	388	154	78	56	109	.....
13	.....	618	352	109	62	130	396	28	782	384	149	78	56	100	.....
14	.....	546	312	105	60	115	352	29	736	381	142	76	56	90	.....
15	.....	606	276	100	59	109	276	30	749	377	137	76	57	90	.....
								31	816	.....	130	75	.....	87	.....

NOTE.—Daily discharge determined from a fairly well-defined rating curve. Discharge interpolated June 25 to 30.

Monthly discharge of American River near Nile, Wash., for 1910.

[Drainage area, 78 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
May 26-31	955	736	826	10.6	2.37	9,830	B.
June	969	344	541	6.94	7.74	32,200	B.
July	446	130	272	3.49	4.02	16,700	B.
August	130	75	99.4	1.27	1.46	6,110	B.
September	75	56	62.5	.881	.89	3,720	B.
October	374	60	170	2.18	2.51	10,500	B.
Nov. 1-15	1,180	82	330	4.23	2.36	9,820	B.
The period	.....	.....	.....	.....	.....	88,900	

TIETON RIVER BASIN.

GENERAL FEATURES.

Tieton River, the principal tributary of the Naches, rises on the eastern slopes of the Cascade Range in the vicinity of Cowlitz Pass and flows in a general northeasterly direction, joining Naches River about 17 miles above the junction of the latter with the Yakima. A peculiarity of the river is the turbid milk-white appearance of its waters. The water of the South Fork of the Tieton, 25 miles above its mouth, is, however, perfectly clear. The forks head in the glaciers of a peak of the Cascades known locally as Goat Rock.

About 4 miles below the fork is a remarkable soda spring whose waters are very palatable.

The entire flow of Tieton River at low stages will be diverted to irrigate lands in the vicinity of North Yakima. The amount so taken will be replaced from the Bumping Lake storage reservoir on the headwaters of the Naches.

TIETON RIVER AT M'ALLISTER MEADOWS, NEAR NACHES, WASH.

The station, which is located 800 feet above the McAllister Meadows dam site and about 30 miles southwest of Naches, Wash , was estabtablished August 28, 1908, to determine the relation between the flow at this point and that at the headworks of the Tieton Canal and at the mouth of Tieton River, where records of several years' standing are available.

The station is about 1½ miles below the mouth of South Fork of Tieton River, half a mile above the mouth of Wildcat Creek, and 9 miles above the headworks of Tieton Canal.

The vertical staff gage is nailed to a tree on the left bank, 100 feet above the cable from which discharge measurements are made.

The records may be considered excellent.

Discharge measurements of Tieton River at McAllister Meadows, near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis. charge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 15	H. D. McGlashan	103	273	3.04	1,010
July 7	R. K. Ray	101	239	2.51	693
Aug. 26	H. Kimble	99	137	1.66	247

Daily gage height, in feet, of Tieton River at McAllister Meadows, near Naches, Wash., for 1910.

[John Russell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.1	.....	2.60	3.10	3.60	2.47	2.00	1.50	1.82	.....	1.93
2	1.42	.....	.....	2.65	3.00	3.20	2.49	1.95	.....	1.58	1.50	2.00
3	.....	2.05	.....	2.70	2.91	3.05	2.47	.....	1.65	3.29	.....	2.02
4	1.4	.....	.....	2.45	3.00	3.00	2.30	.....	.....	2.60	1.52	1.99
5	.....	1.9	.....	2.60	3.02	3.10	2.40	.....	1.61	2.15	.....	1.95
6	.....	1.8	.....	2.57	3.15	3.12	2.40	.....	.....	2.32	1.65	1.90
7	1.36	.....	.....	2.55	3.55	2.99	2.50	1.95	1.72	2.45	2.09	1.88
8	1.3	1.8	.....	2.52	3.74	2.82	2.45	.....	.....	2.25	2.4	1.87
9	.....	1.75	.....	2.44	3.80	2.80	2.50	2.04	1.55	2.27	1.92	1.81
10	1.25	.....	.....	2.61	4.56	2.95	2.55	1.94	.....	2.05	4.6	1.72
11	.....	1.8	.....	2.79	4.17	3.77	2.65	.....	1.49	1.85	3.25	1.71
12	1.2	1.75	.....	2.91	3.85	3.25	.....	.....	.....	1.8	2.64	1.73
13	.....	1.75	2.6	2.85	3.70	3.00	2.40	.....	1.50	1.7	2.25	.....
14	1.3	1.7	2.65	2.74	3.50	2.91	2.30	1.80	1.67	1.68	2.10	.....
15	.....	1.65	.....	2.70	3.28	3.04	2.20	.....	1.62	1.65	.....	.....
16	1.4	1.6	3.0	2.72	3.15	3.00	2.30	1.70	.....	1.64	1.99	1.65
17	1.6	1.6	3.1	2.81	3.10	2.75	2.25	.....	1.60	2.55	.....	.....
18	.....	.....	3.4	2.95	3.45	2.68	2.20	.....	.....	.....	1.89	.....
19	1.5	1.55	3.9	3.34	3.28	2.97	.....	1.45	1.50	1.80	.....	.....
20	.....	.....	4.35	3.60	3.17	2.75	.....	.....	.....	.....	2.00	1.62
21	.....	.....	4.45	3.51	3.18	2.65	2.25	.....	1.75	1.68	4.17	.....
22	2.0	.....	4.1	3.30	3.34	2.45	2.20	.....	.....	1.66	3.20	.....
23	2.3	.....	3.75	3.62	3.64	2.50	2.15	.....	1.70	.....	2.71	1.75
24	3.2	.....	3.45	3.85	3.90	2.45	.....	.....	.....	1.87	2.48	.....
25	2.7	.....	3.25	4.18	3.90	2.55	2.04	.....	1.58	2.56	2.29	.....
26	2.5	.....	3.11	4.38	3.55	2.60	2.00	.....	.....	1.89	2.21	.....
27	.....	.....	2.97	4.10	3.45	2.58	.....	.....	1.50	1.74	2.12	1.65
28	2.35	.....	2.85	3.61	3.20	2.56	2.00	1.55	1.52	1.68	2.09	.....
29	.....	.....	2.76	3.39	3.25	2.50	2.00	.....	1.53	1.67	2.02	.....
30	2.4	.....	2.7	3.20	3.20	2.52	.....	1.60	1.51	.....	1.99	.....
31	.....	.....	2.65	.....	3.35	.....	1.95	.....	.....	1.60	.....	1.58

NOTE.—No ice at this station.

Daily discharge, in second-feet, of Tieton River at McAllister Meadows, near Naches, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	190	430	500	715	1,060	1,460	632	380	208	308	220	352
2	190	418	1,450	748	980	1,140	644	360	227	229	208	380
3	188	405	1,250	780	917	1,020	632	360	250	1,210	210	390
4	185	372	970	620	980	980	530	360	244	715	213	376
5	182	340	750	715	996	1,060	590	360	237	455	205	360
6	180	300	675	696	1,100	1,080	590	360	250	542	250	340
7	177	300	625	682	1,420	973	650	360	272	620	425	332
8	164	300	615	663	1,590	858	620	380	240	505	590	328
9	160	282	630	614	1,640	845	650	400	221	515	348	304
10	156	291	650	722	2,370	945	682	356	215	405	2,410	272
11	152	300	660	838	1,980	1,610	748	350	206	320	1,180	268
12	147	282	680	917	1,690	1,180	669	350	207	300	741	276
13	156	282	715	878	1,550	980	590	350	208	265	505	270
14	164	265	748	806	1,380	917	530	300	256	259	430	270
15	174	250	850	780	1,200	1,010	480	275	240	250	400	270
16	185	234	980	793	1,100	980	530	265	250	246	376	250
17	234	234	1,060	852	1,060	812	505	250	234	682	340	230
18	221	228	1,300	945	1,340	767	480	240	235	350	336	230
19	208	221	1,730	1,250	1,200	959	470	196	208	300	320	230
20	265	215	2,160	1,460	1,120	812	480	240	260	270	380	240
21	320	210	2,260	1,390	1,120	748	505	240	282	259	1,980	250
22	380	215	1,910	1,220	1,250	620	480	240	280	253	1,140	250
23	530	215	1,600	1,480	1,500	650	455	240	265	230	786	282
24	1,140	230	1,340	1,680	1,730	620	440	240	240	328	638	280
25	780	260	1,180	1,990	1,730	682	400	230	229	689	525	270
26	650	250	1,070	2,190	1,420	715	380	230	225	336	485	270
27	600	270	950	1,910	1,340	701	380	230	208	279	440	250
28	560	280	878	1,470	1,140	689	380	221	213	259	425	240
29	575	.....	819	1,290	1,180	650	380	228	216	256	390	240
30	590	.....	780	1,140	1,140	663	360	234	211	240	376	230
31	510	.....	748	.....	1,260	.....	360	220	.....	234	.....	229

NOTE.—Daily discharge determined from a rating curve well defined below 1,200 second-feet. Above 200 second-feet it is practically the same as the 1909 curve. Discharge for days on which gage was not read estimated from hydrograph comparison with the station at the headworks.

Monthly discharge of Tieton River at McAllister Meadows, near Naches, Wash., for 1910.

[Drainage area, 187 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	1,140	147	333	1.78	2.05	20,500	B.
February	430	210	281	1.50	1.56	15,600	C.
March	2,260	500	1,050	5.62	6.48	64,600	C.
April	2,190	614	1,070	5.72	6.38	63,700	A.
May	2,370	917	1,340	7.17	8.27	82,400	A.
June	1,610	620	904	4.83	5.39	53,800	A.
July	748	360	522	2.80	3.23	32,200	A.
August	400	196	292	1.56	1.80	18,000	B.
September	282	206	235	1.26	1.41	14,000	B.
October	1,210	229	391	2.09	2.41	24,000	A.
November	2,410	205	576	3.08	3.44	34,300	A.
December	390	229	282	1.51	1.74	17,300	B.
The year	2,410	147	608	3.25	44.16	440,000	

TIETON RIVER AT HEADWORKS OF TIETON CANAL, NEAR NACHES, WASH.

This station, which is located about 500 feet below the intake of Tieton canal (recently constructed by the United States Reclamation Service), and 15 miles above the mouth of the stream, in sec. 30, T. 14 N., R. 15 E. (unsurveyed), was first established March 29, 1906, about 1 mile below the intake of Tieton canal, about 21 miles southwest of Naches, Wash., and was removed to its present site, about one-half mile farther upstream, on June 27, 1907. The river receives no tributaries in the immediate vicinity of the station.

At the original site a vertical staff gage at the cable section was used; at the present site two gages have been used, one 20 feet below the cable from which measurements are made, the other at Weisberger's power plant, 1½ miles downstream. During 1907 and 1908 the measurements were referred to both gages and a rating curve developed for each. From January 1 to April 8, 1909, the powerhouse gage was read, but these gage heights were reduced to the datum of the cable gage by means of a relation curve between the two gages. On July 28, 1909, a Bristol automatic recording gage was installed at the cable at the same datum as the staff gage there.

Anchor ice occasionally forms on the rocks of the riffle control and causes backwater.

Gage heights for 1910 were furnished by the United States Reclamation Service and are referred to the staff gage.

The rating curve is well defined, and the record may be considered excellent.

Discharge measurements of Tieton River at headworks of Tieton canal, near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 2	H. Kimble	101	260	4.18	1,050
18	Ebert and Kimble	104	288	4.55	1,270
26	C. F. Gleason	103	295	4.78	1,460
June 14	H. D. McGlashan	98	246	4.04	924
28	Gleason and Ray	95	205	3.68	726
July 25	do	89	146	3.10	396
Aug. 5	C. F. Gleason	90	134	2.89	331
6	do	90	139	2.98	359
23	do	90	105	2.61	226
25	R. H. Bolster	88	130	2.73	275

Daily gage height, in feet, of Tieton River at headworks of Tieton canal, near Naches, Wash., for 1910.

[Staff gage. Clarence Clements, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.60	3.17	3.84	3.98	4.33	4.86	3.59	2.96	2.70	2.83	2.64	3.06
2	3.54	3.10	5.15	3.97	4.21	4.46	3.60	2.92	2.70	2.74	2.66	3.10
3	3.54	3.04	4.95	3.82	4.16	4.23	3.53	2.93	2.74	3.87	2.64	3.19
4	3.69	3.00	4.60	3.77	4.18	4.15	3.53	3.00	2.75	3.57	2.61	3.09
5	3.83	3.11	4.30	3.81	4.24	4.22	3.52	2.94	2.74	3.28	2.60	3.05
6	4.14	3.02	4.02	3.85	4.39	4.30	3.52	2.94	2.74	3.32	2.63	3.04
7	4.18	3.00	3.90	3.80	4.72	4.14	3.60	2.98	2.64	3.52	2.92	3.02
8	4.10	2.88	3.83	3.78	5.02	3.98	3.64	2.97	2.64	3.38	3.24	3.02
9	4.12	2.90	3.80	3.82	5.05	3.92	3.64	3.03	2.60	3.42	3.02	2.99
10	4.17	2.85	3.86	3.86	5.55	4.12	3.66	3.04	2.61	3.14	4.82	2.87
11	4.16	2.88	4.00	4.00	5.42	4.56	3.68	2.96	2.58	3.00	4.54	2.86
12	4.19	2.87	4.10	4.22	5.15	4.50	3.68	2.98	2.56	2.92	3.82	2.91
13	4.18	2.88	4.29	4.17	4.94	4.15	3.60	2.98	2.58	2.88	3.52	2.90
14	3.95	2.85	4.46	4.02	4.70	4.04	3.50	2.93	2.59	2.80	3.36	2.89
15	3.86	2.81	4.58	4.02	4.51	4.12	3.42	2.86	2.65	2.82	3.23	2.88
16	3.86	2.70	4.69	4.04	4.42	4.06	3.47	2.80	2.68	2.79	3.13	2.90
17	3.88	2.78	4.85	4.10	4.41	3.94	3.40	2.79	2.76	3.22	3.05	2.80
18	3.61	2.78	4.98	4.30	4.54	3.80	3.29	2.86	2.66	3.24	3.00	2.74
19	2.92	2.78	5.50	4.68	4.48	3.91	3.22	2.88	2.69	2.95	2.94	2.74
20	2.67	2.77	5.80	4.95	4.34	3.93	3.26	2.96	2.74	2.84	3.06	2.72
21	2.68	2.72	5.68	4.75	4.36	3.74	3.30	2.95	2.86	2.81	5.10	2.74
22	3.04	2.68	5.50	4.70	4.53	3.66	3.38	2.87	2.82	2.74	4.41	2.74
23	3.47	2.68	5.20	4.78	4.74	3.58	3.17	2.84	2.79	2.66	3.96	2.82
24	4.26	2.71	4.88	5.12	5.06	3.60	3.20	2.80	2.70	2.76	3.66	2.90
25	3.78	2.86	4.68	5.42	5.06	3.66	3.15	2.75	2.69	3.51	3.42	2.82
26	3.51	2.77	4.50	5.50	4.74	3.74	3.12	2.76	2.66	3.05	3.36	2.84
27	3.38	2.84	4.32	5.22	4.60	3.73	3.07	2.78	2.67	2.82	3.31	2.76
28	3.32	2.88	4.25	4.90	4.36	3.70	3.05	2.77	2.68	2.72	3.24	2.75
29	3.20	.....	4.09	4.67	4.34	3.60	3.04	2.70	2.71	2.72	3.18	2.74
30	3.28	.....	4.02	4.50	4.48	3.58	3.02	2.72	2.82	2.68	3.11	2.75
31	3.30	.....	4.02	.....	4.62	.....	2.94	2.73	.....	2.67	.....	2.75

NOTE.—River frozen to a considerable extent about Jan. 1 to 23; ice reported along the banks Feb. 22 to 25. Gage heights probably not materially affected by ice during the rest of the year.

Daily discharge, in second-feet, of Tieton River at headworks of Tieton canal, near Naches, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	250	458	811	893	1,120	1,550	675	361	258	307	238	406
2	240	425	1,840	887	1,040	1,210	680	344	258	273	246	425
3	240	397	1,640	800	1,010	1,050	642	348	273	828	238	467
4	230	378	1,320	772	1,020	1,000	642	378	276	664	228	420
5	230	430	1,100	795	1,060	1,050	637	352	273	511	225	402
6	225	387	918	817	1,160	1,100	637	352	273	531	235	397
7	225	378	845	789	1,420	996	680	369	238	637	344	387
8	220	327	806	778	1,710	893	702	365	238	563	492	387
9	215	335	789	800	1,740	857	702	392	225	584	387	374
10	210	315	823	823	2,350	983	712	397	228	444	1,510	323
11	200	327	905	905	2,180	1,290	723	361	219	378	1,270	319
12	200	323	970	1,050	1,840	1,240	723	369	213	345	800	339
13	200	327	1,090	1,020	1,680	1,000	680	369	219	327	637	335
14	200	315	1,210	918	1,400	931	626	348	222	295	552	331
15	200	300	1,300	918	1,250	983	584	319	242	303	487	327
16	225	258	1,390	931	1,180	944	610	295	251	291	439	335
17	260	287	1,540	970	1,180	869	573	291	280	482	402	295
18	250	287	1,670	1,100	1,270	789	516	319	245	492	378	273
19	260	288	2,280	1,380	1,230	851	482	327	255	356	352	273
20	310	284	2,710	1,640	1,130	863	501	361	273	311	406	265
21	375	265	2,530	1,440	1,140	756	521	356	319	299	1,790	273
22	550	251	2,280	1,400	1,260	712	563	323	303	273	1,180	273
23	610	251	1,900	1,470	1,440	669	458	311	291	246	881	308
24	1,070	262	1,570	1,810	1,750	680	472	295	258	280	712	335
25	778	319	1,380	2,180	1,750	712	448	276	255	631	584	303
26	631	284	1,240	2,280	1,440	756	434	280	245	402	552	311
27	563	311	1,110	1,920	1,320	750	411	288	248	303	526	280
28	531	327	1,070	1,590	1,140	734	402	284	251	265	492	276
29	472	.....	964	1,380	1,130	680	397	258	262	265	463	273
30	511	.....	918	1,240	1,230	669	387	265	303	251	430	276
31	521	.....	918	.....	1,340	.....	352	269	.....	248	.....	276

NOTE.—Daily discharge determined from a rating curve well defined below 1,700 second-feet. Daily discharge Jan 1 to 23 estimated by hydrograph comparison with station at McAllister Meadows

Monthly discharge of Tieton River at headworks of Tieton canal, near Naches, Wash., for 1910.

[Drainage area, 247 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total acre-feet.	
January	1,070	200	361	1.46	1.68	22,200	C.
February	458	251	325	1.32	1.38	18,000	A.
March	2,710	789	1,350	5.47	6.31	83,000	B.
April	2,280	772	1,190	4.82	5.38	70,800	A.
May	2,350	1,010	1,380	5.59	6.44	84,800	A.
June	1,550	669	919	3.72	4.15	54,700	A.
July	723	352	567	2.30	2.65	34,900	A.
August	397	258	330	1.34	1.54	20,300	A.
September	319	213	256	1.04	1.16	15,200	A.
October	828	246	400	1.62	1.87	24,600	A.
November	1,790	225	583	2.36	2.63	34,700	A.
December	467	265	331	1.34	1.54	20,400	A.
The year	2,710	200	668	2.70	36.73	484,000	

TIETON RIVER AT COBB'S RANCH, NEAR NACHES, WASH.

This station, which is located at Cobb's ranch, below the mouth of Oak Creek, was established April 24, 1902, at a point a short distance above the present site. On March 7, 1906, it was moved to a point 200 feet above the mouth of Oak Creek, thus excluding 19 square miles of drainage area. On March 23, 1907, it was moved to the highway bridge at camp No. 1 of the United States Reclamation Service; at this point it was between the intake and tail race of the power canal which furnished electric power for construction of two large tunnels on the Tieton canal; no attempt to determine discharges was made while the plant was in operation. The present site has been used since April 14, 1909.

An inclined staff gage bolted to solid rock on the left bank 100 feet upstream from the cable was used until March 5, 1910, when it was replaced by a standard chain gage at the same location and with the same datum. Measurements are made from a cable.

The banks of the stream are solid basalt and will not change. The bed of the stream is of gravel and may shift slightly in floods. The right bank has a gentle slope and is lightly covered with soil and is timbered to almost the water's edge.

The records at low water, which are of the greatest importance, are poor on account of lack of measurements; estimates of discharge are withheld until more measurements can be made.

Discharge measurements of Tieton River at Cobb's ranch, near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 28	H. Kimble	72	125	4.70	352
Mar. 5	do	87	266	6.42	1,500
21	McGlashan and Kimble	116	427	8.20	3,310
May 3	H. Kimble	85	226	6.03	1,120
19	do	85	247	6.47	1,360
June 14	H. D. McGlashan	83	215	5.91	994
July 8	R. K. Roy	82	195	5.48	764
Aug. 25	H. Kimble	67	120	4.53	270
Nov. 23	do	83	216	5.92	987

Daily gage height, in feet, of Tieton River at Cobb's ranch, near Naches, Wash., for 1910.

[E. Parmenter, observer.]

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	6.6	5.9	6.25	6.85	5.45	4.7	4.4
2	.....	6.75	5.8	6.05	6.35	5.45	4.65	4.4
3	.....	7.4	5.75	6.0	6.05	5.35	4.65	4.45
4	.....	6.7	5.65	6.15	6.15	5.35	4.65	4.5
5	.....	6.5	5.7	6.1	6.05	5.35	4.7	4.5
6	.....	6.0	5.75	6.25	6.1	5.25	4.6	4.5
7	.....	5.8	5.7	6.6	6.0	5.45	4.75	4.35
8	.....	5.75	5.7	6.8	5.7	5.45	4.75	4.3
9	.....	5.75	5.7	7.05	5.65	5.55	4.8	4.3
10	.....	5.7	5.75	7.45	5.85	5.45	4.85	4.25
11	.....	5.9	5.9	7.55	6.55	5.45	4.75	4.25
12	.....	6.05	6.1	7.05	6.45	5.45	4.75	4.2
13	.....	6.2	6.1	6.85	6.15	5.55	4.75	4.2
14	.....	6.45	6.0	6.65	5.95	5.45	4.75	4.2
15	.....	6.55	5.9	6.35	5.95	5.25	4.7	4.15
16	.....	6.7	6.0	6.25	5.85	5.25	4.6	4.3
17	.....	7.0	6.15	6.25	5.75	5.25	4.55	4.4
18	.....	7.05	6.2	6.35	5.75	5.15	4.65	4.4
19	.....	7.75	6.7	6.25	5.65	5.05	4.65	4.4
20	.....	8.25	7.0	6.15	5.75	5.05	4.7	.....
21	.....	8.25	6.9	6.15	5.55	5.05	4.7	.....
22	.....	7.85	6.8	6.25	5.45	5.25	4.7	.....
23	.....	7.45	6.8	6.35	5.35	5.05	4.7	.....
24	.....	7.0	7.25	7.05	5.30	4.95	4.6	.....
25	.....	6.65	7.7	7.00	5.45	4.95	4.45	.....
26	.....	6.5	7.95	6.55	5.65	4.85	4.45	.....
27	.....	6.35	7.3	6.45	5.55	4.85	4.45	.....
28	5.6	6.2	7.0	6.15	5.45	4.85	4.5	.....
29	.....	6.0	6.6	6.15	5.45	4.85	4.45	.....
30	.....	5.95	6.4	6.3	5.35	4.80	4.4	.....
31	.....	5.9	.....	6.35	.....	4.75	4.45	.....

NOTE.—Gage readings probably not materially affected by ice, as no ice was reported at this station during the period covered by records.

ATANUM CREEK BASIN.

GENERAL FEATURES.

Atanum Creek is formed by the union of North and South forks, in Yakima County, near Tampico, Wash. It flows eastward, joining Yakima River about 10 miles below the mouth of Naches River. The creek and its South Fork make the greater part of the northern boundary of the Yakima Indian Reservation. Its waters are extensively used for the irrigation of Indian lands on the south side and for lands belonging to white settlers on the north. Throughout the lower portion of the stream it receives considerable return water from this irrigation.

NORTH FORK OF ATANUM CREEK NEAR TAMPICO, WASH.

This station, which is located in sec. 2, T. 12 N., R. 15 E., on the North Fork at Goodman's ranch, 3 miles above Tampico, Wash. 3½ miles above the junction with South Fork, and 100 feet below the mouth of Nasty Creek, was established August 26, 1907. It is above all diversions from the stream.

The vertical staff gage is spiked to a small cottonwood tree on the left bank. Discharge measurements are made by wading in the vicinity of the gage, or from a cable during high water.

There has been no change in gage datum. The records at the station are not complete, as it was impossible to obtain continuous observations of gage heights. A well-defined rating curve has been constructed and the records may be considered good except during periods when gage heights are missing. At such times fair estimates are made by comparison with records of flow at lower stations.

Discharge measurements of North Fork of Atanum Creek near Tampico, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 19	Kimble and McGlashan	30	73	2.80	411
Apr. 25	H. D. McGlashan	30	65	2.70	364
June 6	do	29.5	37	2.17	161
July 8[a]	do	21	30	1.60	62.4
Aug. 26[a]	do	26	24	1.22	24.4

[a] Made by wading.

Daily gage height, in feet, of North Fork of Atanum Creek near Tampico, Wash., for 1910.

[Geo. Prior, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	1.8	2.91	.....	.....	.....	1.6	1.2	1.2	1.2	1.2	1.4
2	1.7	1.7	3.3	.....	.....	.....	1.6	1.1	1.2	1.2	1.2	1.4
3	1.75	1.7	2.8	.....	.....	.....	1.55	1.1	1.2	1.4	1.2	1.4
4	1.9	1.7	2.65	.....	.....	.....	1.6	1.1	1.2	1.4	1.2	1.4
5	1.9	1.7	2.5	.....	.....	.....	1.6	1.1	1.2	1.3	1.2	1.4
6	1.9	1.7	2.4	.....	.....	2.17	1.55	1.15	1.2	1.3	1.2	1.3
7	1.9	1.8	2.4	.....	.....	2.17	1.55	1.2	1.3	1.3	1.2	1.3
8	2.0	1.75	2.3	.....	.....	2.2	1.5	1.15	1.25	1.3	1.2	1.3
9	2.0	1.7	2.3	.....	.....	2.15	1.5	1.15	1.25	1.3	1.2	1.3
10	1.95	.....	.....	.....	.....	2.1	1.5	1.1	1.25	1.3	1.3	1.2
11	1.85	.....	.....	.....	.....	2.2	1.5	1.2	1.3	1.2	1.4	1.3
12	1.72	1.5	.....	.....	.....	2.1	1.5	1.2	1.3	1.3	1.3	1.3
13	1.7	1.5	.....	.....	.....	2.0	1.5	1.2	1.3	1.3	1.3	1.3
14	1.7	1.5	.....	.....	.....	1.95	1.5	1.2	1.3	1.3	1.3	1.3
15	1.7	1.5	.....	.....	.....	2.0	1.5	1.2	1.3	1.3	1.3	1.3
16	1.7	1.52	.....	.....	.....	2.0	1.5	1.2	1.3	1.3	1.3	1.3
17	1.7	1.5	.....	.....	.....	1.9	1.55	1.2	1.3	1.3	1.3	1.3
18	1.75	1.5	.....	.....	.....	1.9	1.55	1.2	1.3	1.3	1.3	1.3
19	1.78	1.5	.....	.....	.....	2.02	1.4	1.2	1.3	1.2	.....	1.3
20	1.7	1.5	.....	.....	.....	1.9	1.45	1.2	1.3	1.2	.....	1.3
21	1.65	1.5	.....	.....	.....	1.85	1.3	1.2	1.3	1.2	.....	1.2
22	1.85	1.5	.....	.....	.....	1.8	1.3	1.2	1.3	1.3	.....	1.2
23	2.18	1.5	.....	.....	.....	1.75	1.3	1.2	1.3	1.3	.....	1.3
24	2.78	1.6	.....	.....	.....	1.7	1.3	1.2	1.2	1.3	.....	1.3
25	2.42	1.62	.....	.....	.....	1.7	1.27	1.2	1.2	1.3	.....	1.3
26	.....	1.65	.....	.....	.....	1.7	1.25	1.2	1.2	1.2	.....	1.3
27	1.9	1.7	.....	.....	.....	1.7	1.2	1.2	1.3	1.2	1.4	1.3
28	1.95	1.7	.....	.....	.....	1.75	1.2	1.2	1.3	1.2	1.4	1.3
29	1.8	.....	.....	.....	.....	1.7	1.2	1.2	1.3	1.2	1.4	1.3
30	1.98	.....	.....	.....	.....	1.65	1.2	1.2	1.3	1.2	1.4	1.3
31	1.95	.....	.....	.....	.....	.....	1.2	1.2	.....	1.2	.....	1.3

NOTE.—No ice reported at this station. No gage readings were obtained Mar. 10 to June 5, as the observer was absent.

Daily discharge, in second-feet, of North Fork of Atanum Creek near Tampico, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct	Nov.	Dec.
1	75	90	464	.....	.....	215	62	23	23	23	23	40
2	75	75	684	.....	.....	190	62	17	23	23	23	40
3	82	75	411	.....	.....	176	56	17	23	40	23	40
4	106	75	338	.....	.....	161	62	17	23	40	23	40
5	106	75	272	.....	.....	162	62	17	23	31	23	40
6	106	75	232	.....	.....	158	56	20	23	31	23	31
7	106	90	232	.....	.....	158	56	23	31	31	23	31
8	125	82	197	.....	.....	169	51	20	27	31	23	31
9	125	75	197	.....	.....	158	51	20	27	31	23	31
10	116	67	.....	.....	.....	146	51	17	27	31	31	23
11	98	59	.....	.....	.....	169	51	23	31	23	40	31
12	75	51	.....	.....	.....	146	51	23	31	31	31	31
13	75	51	.....	.....	.....	125	51	23	31	31	31	31
14	75	51	.....	.....	.....	116	51	23	31	31	31	31
15	75	51	.....	.....	.....	125	51	23	31	31	31	31
16	75	51	.....	.....	.....	125	51	23	31	31	31	31
17	75	51	.....	.....	.....	106	56	23	31	31	31	31
18	82	51	.....	.....	.....	106	56	23	31	31	31	31
19	90	51	.....	.....	.....	125	40	23	31	23	33	31
20	75	51	.....	.....	.....	106	40	23	31	23	33	31
21	68	51	.....	.....	.....	98	31	23	31	23	31	23
22	98	51	.....	.....	.....	90	31	23	31	31	28	23
23	169	51	.....	.....	.....	82	31	23	31	31	70	31
24	411	62	.....	.....	.....	75	31	23	23	31	62	31
25	232	62	.....	.....	.....	75	29	23	23	31	54	31
26	169	68	.....	.....	.....	75	27	23	23	23	40	31
27	106	75	.....	.....	.....	75	23	23	31	23	40	31
28	116	75	.....	.....	.....	82	23	23	31	23	40	31
29	90	.....	.....	.....	.....	75	23	23	31	23	40	31
30	125	.....	.....	.....	.....	68	23	23	31	23	40	31
31	116	.....	.....	.....	.....	.....	23	23	.....	23	.....	31

NOTE.—Daily discharge determined from a rating curve well defined below 500 second-feet. Daily discharge for June 1 to 5 and Nov. 19 to 26 computed as the difference between flow at "The Narrows" station and that of the South Fork.

Monthly discharge of North Fork of Atanum Creek near Tampico, Wash., for 1910.

[Drainage area, 66 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	411	68	113	1.71	1.97	6,950	B.
February	90	51	64	.970	1.01	3,550	B.
March	684	.....	303	4.59	5.29	18,600	D.
April	.....	.....	222	3.36	3.75	13,200	C.
May	.....	.....	246	3.73	4.30	15,100	C.
June	215	68	125	1.89	2.11	7,440	B.
July	62	23	44.1	.668	.77	2,710	B.
August	23	17	21.7	.329	.38	1,330	B.
September	31	23	28.2	.427	.48	1,680	B.
October	40	23	28.5	.432	.50	1,750	B.
November	70	23	33.5	.508	.57	1,990	B.
December	40	23	31.7	.480	.55	1,950	B.
The year	684	17	105	1.59	21.68	76,200	

NOTE.—Monthly means for April and May were computed by subtracting the discharge at South Fork from that at "The Narrows" station. The mean for March is found by making a similar estimate for the period Mar. 10 to 31. This estimate gives only approximate results for March as there was probably a considerable inflow from the intervening area, but the results for April and May are probably fair, as the inflow had largely ceased by that time.

ATANUM CREEK AT THE NARROWS, NEAR TAMPICO, WASH.

This station, which is located in sec. 15, T. 12 N., R. 16 E., at a point in the river locally known as "The Narrows," 3½ miles east of

Tampico, Wash., and 3 miles below the junction of the North and South forks, was established June 25, 1908.

The vertical gage is on the right bank near the highway about 100 feet above the ford.

The John Cox ditch diverts 8 to 10 second-feet from the North Fork past the station. The records should not therefore be considered to represent the natural run-off from this drainage area.

Discharge measurements were made from a car and cable installed during 1910.

There has been no change in gage datum, and the record as a whole may be considered excellent.

Discharge measurements of Atanum Creek at the Narrows, near Tampico, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 19	McGlashan and Kimble	26	73.4	2.50	[a] 580
Apr. 26	H. D. McGlashan	30	77.8	2.45	518
May 16	H. Kimble	29	63.8	1.90	273
June 7	H. D. McGlashan	29	49.0	1.45	187
25	do	29	35.1	0.96	87.
July 9[b]	do	27	34.3	0.79	62.
Aug. 26[b]	do	26	24.4	0.40	19.

[a] Partly estimated. [b] Wading measurements.

Daily gage height, in feet, of Atanum Creek at the Narrows, near Tampico, Wash., for 1910

[Fred B. Dye, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
1	.....	1.78	.....	1.65	.....	1.70	0.85	0.45	0.42	0.43	0.35	0.
2	.....	1.72	4.00	1.60	1.85	1.60	.80	.45	.42	.....	.35	.
3	1.38	1.65	3.00	.....	1.80	1.55	.....	.45	.43	.46	.35	.
4	1.37	1.60	2.80	1.50	1.70	1.50	.....	.46	.....	.46	.35	...
5	1.36	1.55	2.50	1.50	1.85	.....	.82	.42	.....	.45	.35	.
6	1.36	.....	.....	1.48	1.85	1.45	.84	.42	.46	.44	.....	.
7	1.38	1.48	1.90	1.45	2.00	1.42	.82	.....	.47	.43	.35	.
8	1.38	1.46	1.80	1.48	.....	1.40	.75	.42	.47	.43	.50	.
9	.....	1.44	1.87	1.50	2.10	1.32	.80	.42	.47	.....	.70	.
10	1.30	1.40	1.90	.....	2.45	1.28	.....	.42	.46	.43	.90	.
11	1.28	1.39	1.95	1.70	2.35	1.32	.77	.43	.....	.40	.90	...
12	1.26	1.37	2.00	1.65	2.25	.....	.72	.43	.45	.40	.80	.
13	1.25	.....	.....	1.65	2.10	1.25	.70	.43	.45	.39	.....	.
14	1.24	1.36	2.20	1.61	2.05	1.20	.70	.....	.46	.39	.70	.
15	1.22	1.35	2.25	1.58	.....	1.19	.70	.44	.46	.39	.68	.
16	.....	1.30	2.27	1.60	2.00	1.20	.65	.45	.46	.....	.65	.
17	1.18	1.30	2.37	.....	1.90	1.19	.....	.46	.47	.38	.60	.
18	1.20	1.29	2.40	1.75	1.90	1.19	.60	.45	.....	.38	.65	...
19	1.22	1.28	2.50	1.90	1.90	.....	.58	.45	.47	.38	.68	.
20	1.24	.....	.....	2.00	1.85	1.15	.57	.44	.47	.37	.....	.
21	1.25	1.28	3.00	2.00	1.90	1.10	.55	.....	.48	.37	.68	.
22	1.30	.....	2.75	1.95	.....	1.09	.53	.43	.48	.37	.65	.
23	.....	1.29	2.50	2.00	1.90	1.05	.50	.42	.47	.....	.95	.
24	2.50	1.29	2.30	.....	2.00	1.00	.....	.42	.47	.36	.....	.
25	2.12	1.30	2.20	2.20	1.95	1.00	.50	.41	.....	.36	.85	...
26	1.97	1.29	2.00	2.40	1.90	.....	.48	.40	.43	.35	.75	.
27	1.82	.....	.....	2.30	1.82	.90	.48	.40	.40	.35	.....	.
28	1.73	1.66	1.80	2.10	1.80	.90	.46	.....	.40	.35	.70	.
29	1.62	.....	1.80	2.00	.....	.88	.45	.40	.39	.35	.70	.
30	2.85	.....	1.70	1.90	.....	.87	.45	.41	.39	.....	.75	.
31	1.82	.....	1.65	.....	1.60	.....	.....	.42	.....	.35	.....	

NOTE.—No ice reported at this station. Observer estimated crest for Mar. 1 at gage height 4.85.

Daily discharge, in second-feet, of Atanum Creek at the Narrows, near Tampico, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	172	281	[a]1,330	242	311	257	70	24	21	22	16	49
2	172	263	1,330	228	303	228	62	24	21	23	16	49
3	172	242	780	214	287	214	63	24	22	24	16	56
4	170	228	680	199	257	199	64	24	22	24	16	52
5	168	214	546	199	303	194	65	21	23	24	16	49
6	168	204	432	194	303	188	68	21	24	23	16	49
7	172	194	319	188	352	181	65	21	25	22	16	48
8	172	190	287	194	370	176	56	21	25	22	28	48
9	164	185	309	199	387	159	62	21	25	22	49	48
10	155	176	319	228	524	151	60	21	24	22	78	48
11	151	174	336	257	482	159	58	22	24	19	78	43
12	147	170	352	242	442	152	52	22	24	19	62	38
13	144	169	387	242	387	144	49	22	24	18	56	36
14	142	168	422	231	368	134	49	22	24	18	49	36
15	138	166	442	223	360	132	49	23	24	18	47	36
16	134	155	449	228	352	134	44	24	24	18	44	35
17	130	155	490	250	319	132	41	24	25	18	38	33
18	134	153	502	272	319	132	38	24	25	18	44	36
19	138	151	546	319	319	128	36	24	25	18	47	38
20	142	151	663	352	303	124	35	23	25	17	47	44
21	144	151	780	352	319	114	33	22	26	17	47	47
22	155	152	657	336	319	112	31	22	26	17	44	49
23	350	153	546	352	319	104	28	21	25	16	86	49
24	546	153	461	379	352	95	28	21	25	16	78	47
25	394	155	422	422	336	95	28	20	24	16	70	47
26	342	153	352	502	319	86	26	19	22	16	56	47
27	293	199	320	461	293	78	26	19	19	16	52	38
28	266	245	287	387	287	78	24	19	19	16	49	38
29	233	.....	287	352	268	75	24	19	18	16	49	38
30	705	.....	257	319	248	73	24	20	18	16	56	38
31	293	.....	242	.....	228	.....	24	21	.....	16	.....	38

[a] Estimated mean for day.

NOTE.—Daily discharge determined from a rating curve well defined below 250 second-feet and fairly well defined between 250 and 600 second-feet.

Monthly discharge of Atanum Creek at the Narrows, near Tampico, Wash., for 1910.

[Drainage area, 116 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	705	130	220	1.90	2.19	13,500	C.
February	281	151	184	1.59	1.66	10,200	B.
March	1,330	242	501	4.32	4.98	30,800	C.
April	502	188	285	2.46	2.74	17,000	B.
May	524	228	333	2.87	3.31	20,500	B.
June	257	73	141	1.22	1.36	8,390	A.
July	70	24	44.6	.384	.44	2,740	A.
August	24	19	21.8	.188	.22	1,340	A.
September	26	18	23.3	.201	.22	1,390	A.
October	24	16	18.9	.163	.19	1,160	A.
November	86	16	45.5	.392	.44	2,710	A.
December	56	33	43.5	.375	.43	2,670	A.
The year	1,330	16	155	1.34	18.18	112,000	

ATANUM CREEK NEAR YAKIMA, WASH.

This station, which is located at the Northern Pacific Railway bridge about 1 mile southeast of Yakima, Wash., was established May 11, 1904, discontinued December 30, 1904, and reestablished August 27, 1907.

Discharge measurements are made from the bridge during high water and by wading at low water. The conditions at this station were unfavorable for accurate results.

The gage read in 1909 was a vertical staff located just above the Northern Pacific Railway bridge. The gage read in 1910 was a vertical staff nailed to the left upstream abutment of the highway bridge, about 100 feet above the Northern Pacific Railway bridge. During construction of a new railway bridge between the two bridges the channel of the stream was frequently and materially altered, and on August 13 the gage was destroyed in the construction work, and readings were discontinued, but sufficient discharge measurements were made to determine the discharge during the rest of the irrigating season.

The record for 1910 may be considered good. No ice forms to interfere with the determination of discharge.

Discharge measurements of Atanum Creek near Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.[a]	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 29	H. Kimble	30	99	5.77	373
July 8	do	6	4.3	2.95	9.3
Aug. 24	do	5.2	3.9	.....	7.8
Sept 6	do	5.5	4.1	.....	7.8
20	do	9.4	7.4	.....	8.2
Oct. 13	F. B. Storey	6	7	.....	9.2
16	Henshaw and Storey	6	7.3	.....	8.6

[a] New gage.

Daily gage height, in feet, of Atanum Creek near Yakima, Wash., for 1910.

[Chas. Atkins, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Day.	Mar.	Apr.	May.	June.	July.	Aug.
1	.....	5.5	.....	5.4	3.1	2.9	16	6.1	5.0	6.1	4.1	3.0	.....
2	6.6	5.4	5.3	5.4	3.2	2.9	17	6.2	.....	5.9	3.9	.....	.....
3	8.9	.....	5.1	5.5	.....	2.9	18	6.3	5.0	5.8	3.8	2.9	.....
4	7.7	5.3	5.7	5.3	3.2	2.9	19	6.4	5.1	5.7	.....	2.9	.....
5	7.0	5.2	5.7	.....	3.2	2.9	20	.....	5.1	5.6	3.9	3.0	.....
6	.....	5.1	5.7	5.1	3.1	2.9	21	7.0	5.2	5.6	3.7	3.0	.....
7	6.4	5.1	5.7	5.0	3.1	.....	22	7.6	5.2	.....	3.6	3.0	.....
8	6.0	5.0	.....	4.8	3.1	3.0	23	7.4	5.3	5.6	3.5	3.0	.....
9	5.8	4.9	5.9	4.7	3.0	3.0	24	6.9	.....	5.5	3.4	.....	.....
10	5.6	.....	6.2	4.5	.....	2.9	25	6.7	5.4	5.5	.....	2.9	.....
11	5.5	4.9	6.3	4.3	3.1	3.0	26	6.4	5.6	5.4	.....	2.9	.....
12	5.7	5.1	6.5	.....	3.1	2.9	27	.....	5.8	5.5	.....	2.9	.....
13	.....	5.2	6.5	4.2	3.1	2.9	28	5.9	5.8	5.6	.....	2.9	.....
14	5.9	5.2	6.4	4.2	3.1	.....	29	5.8	5.7	.....	.....	2.9	.....
15	6.0	5.1	.....	4.1	3.0	.....	30	5.7	5.6	5.4	.....	2.9	.....
							31	5.4	.....	5.3	.....	.....	.....

NOTE.—Readings made on a new gage which was installed Mar. 2 and was destroyed Aug. 13 in the course of the construction of the railway bridge. No gage was installed after that date, as a permanent site could not be found because of the construction work.

Daily discharge, in second-feet, of Atanum Creek near Yakima, Wash., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	500	300	280	275	12	8	8	8
2	628	275	252	275	15	8	8	8
3	1,530	260	212	300	15	8	8	9
4	1,040	252	354	252	15	8	8	9
5	765	231	354	232	15	8	8	9
6	650	212	354	212	12	8	7.8	9
7	564	212	354	194	12	9	8	9
8	440	194	380	160	12	10	8	9
9	382	176	410	144	10	10	8	9.2
10	326	176	500	115	11	8	8	9
11	300	176	532	90	12	10	8	9
12	354	212	596	84	12	8	8	9
13	380	231	596	78	12	8	8	9
14	410	231	564	78	12	8	8	9
15	440	212	510	68	10	8	8	9
16	470	194	470	68	10	8	8	8.6
17	500	194	410	52	9	8	8	9
18	532	194	382	45	8	8	8	9
19	564	212	354	48	8	8	8	9
20	650	212	326	52	10	8	8.2	9
21	765	231	326	38	10	8	8	9
22	1,000	231	326	33	10	8	8	9
23	930	252	326	28	10	8	8	9
24	725	265	300	23	9	7.8	8	9
25	660	275	300	22	8	8	8	9
26	564	326	275	20	8	8	8	9
27	480	382	300	18	8	8	8	9
28	410	382	326	16	8	8	8	9
29	382	354	300	15	8	8	8	9
30	354	326	275	14	8	8	8	9
31	275	.....	252	.....	8	8	.....	9

NOTE.—Daily discharge Mar. 2 to Aug. 13 determined from a fairly well-defined rating curve; discharge for remainder of year interpolated between discharge measurements.

Monthly discharge of Atanum Creek near Yakima, Wash., for 1910.

[Drainage area, 212 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
March	1,530	275	5.80	2.74	3.16	35,700	C.
April	382	176	246	1.16	1.29	14,600	B.
May	596	212	371	1.75	2.02	22,800	B.
June	300	14	102	.482	.54	6,070	B.
July	15	8	10.5	.050	.06	646	B.
August	10	7.8	8.1	.038	.04	498	B.
September	8.2	7.8	8	.038	.04	476	B.
October	9.2	8	8.9	.042	.05	547	B.
The period	.....	.....	.....	.....	.....	81,300	

SOUTH FORK OF ATANUM CREEK NEAR TAMPICO, WASH.

This station, which is located at Shannafelt's ranch, in sec. 24, T. 12 N., R. 15 E., 2 miles above Tampico, Wash., and 2½ miles above the junction with the North Fork of Atanum Creek, was established August 27, 1907. It is above all diversions except two small ditches that take water for individual tracts of land above the station.

The vertical staff gage is on the right bank about 500 feet below the observer's house. There is a small by-channel whose waters do

not pass the gage but are measured at the bridge. During high stages in the summer time the brush on the banks of the stream cause a backwater effect that is not noticeable in the spring and winter, when the leaves are not on the trees.

The banks of the stream are very thickly covered with willows and brush and the channel is not permanent.

Discharge measurements are made by wading at low stages in the vicinity of the gage or from a private bridge one-fourth mile below.

On March 19, 1910, the gage was found to have settled 0.30 foot. The measurements obtained during 1909, however, indicate that this settling occurred previous to 1909 and that the 1909–1910 measurements refer to the same datum.

Discharge measurements of South Fork of Atanum Creek near Tampico, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 19	McGlashan and Kimble	18	40	4.20	148
Apr. 25[a]	H. D. McGlashan	20	35.3	3.80	100
June 6	do	18	22.5	2.99	39.8
July 8[b]	do	11.5	12.6	2.49	11
Aug. 26[b]	do	10	8.8	2.31	4.4

[a] From footbridge. [b] Made by wading.

Daily gage height, in feet, of South Fork of Atanum Creek near Tampico, Wash., for 1910.

[E. A. Shannafelt, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.40	2.00	5.00	3.20	3.40	3.05	2.60	2.40	2.35	2.35	2.50	2.65
2	1.40	1.95	5.50	3.10	3.30	3.00	2.60	2.40	2.35	2.36	2.50	2.65
3	1.40	1.95	4.75	3.10	3.30	3.00	2.60	2.40	2.35	2.35	2.50	2.65
4	1.45	1.90	4.50	3.15	3.40	3.00	2.60	2.38	2.35	2.34	2.50	2.63
5	1.40	1.85	4.00	3.15	3.40	2.90	2.58	2.38	2.35	2.34	2.50	2.63
6	1.55	1.80	3.50	3.10	3.60	2.95	2.58	2.38	2.35	2.34	2.50	2.60
7	1.50	1.70	3.40	3.00	3.60	2.90	2.55	2.38	2.32	2.35	2.51	2.60
8	1.50	1.70	3.30	3.00	3.65	2.90	2.50	2.38	2.32	2.35	2.52	2.60
9	1.50	1.70	3.20	3.00	3.80	2.85	2.50	2.38	2.32	2.35	2.55	2.60
10	1.50	1.65	3.30	3.10	4.00	2.85	2.48	2.38	2.32	2.34	2.50	2.60
11	1.47	1.70	4.40	3.10	4.20	2.85	2.48	2.35	2.32	2.34	2.50	2.60
12	1.45	1.70	4.55	3.20	4.10	2.80	2.48	2.35	2.32	2.45	2.52	2.60
13	1.45	1.70	4.60	3.30	4.10	2.80	2.45	2.35	2.32	2.40	2.55	2.60
14	.....	1.60	4.80	3.30	4.10	2.80	2.45	2.35	2.32	2.40	2.50	2.58
15	1.40	1.60	4.80	3.20	4.05	2.75	2.45	2.35	2.30	2.45	2.55	2.60
16	1.35	1.60	4.90	3.20	4.00	2.75	2.45	2.35	2.34	2.45	2.55	2.60
17	1.30	1.55	4.00	3.20	3.80	2.75	2.45	2.32	2.34	2.48	2.55	2.60
18	1.30	1.50	4.10	3.30	3.75	2.75	2.42	2.32	2.35	2.47	2.55	2.60
19	1.35	1.50	4.20	3.40	3.60	2.75	2.42	2.30	2.35	2.48	2.55	2.60
20	1.50	1.50	4.70	3.55	3.60	2.75	2.42	2.30	2.35	2.48	2.56	2.60
21	1.70	1.50	4.60	3.50	3.60	2.75	2.40	2.30	2.35	2.48	2.60	2.55
22	1.80	1.50	4.20	3.50	.....	2.72	2.40	2.30	2.35	2.47	2.60	2.55
23	2.20	1.50	4.00	3.52	.....	2.70	2.40	2.30	2.35	2.48	2.60	2.55
24	3.20	1.50	3.70	3.60	.....	2.67	2.40	2.30	2.35	2.48	2.60	2.55
25	3.00	1.50	3.65	3.70	.....	2.65	2.40	2.30	2.35	2.48	2.60	2.55
26	2.50	1.50	3.60	4.00	.....	2.65	2.40	2.32	2.35	2.50	2.60	2.55
27	2.00	1.50	3.50	3.90	.....	2.63	2.40	2.32	2.35	2.50	2.65	2.60
28	1.95	1.60	3.40	3.60	.....	2.62	2.40	2.32	2.35	2.50	2.65	2.60
29	1.95	.....	3.35	3.50	.....	2.62	2.40	2.34	2.35	2.50	2.65	2.55
30	1.95	.....	.....	3.45	.....	2.62	2.40	2.35	2.35	2.50	2.65	2.55
31	2.15	.....	.....	.....	.....	.....	2.40	2.35	.....	2.50	.....	2.55

NOTE.—A small amount of ice at this station during the first half of January; gage readings probably not materially affected.

Daily discharge, in second-feet, of South Fork of Atanum Creek near Tampico, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	11	42	272	52	68	42	16	8	6	6	12	18
2	11	39	362	45	60	38	16	8	6	6	12	18
3	11	39	228	45	60	38	16	8	6	6	12	18
4	13	36	189	48	68	38	16	7	6	6	12	18
5	11	33	124	48	68	32	15	7	6	6	12	18
6	18	30	76	45	84	36	15	7	6	6	12	16
7	15	25	68	38	84	32	14	7	5	6	12	16
8	15	25	60	38	89	32	12	7	5	6	13	16
9	15	25	52	38	104	29	12	7	5	6	14	16
10	15	22	60	45	124	29	11	7	5	6	12	16
11	14	25	175	45	148	29	11	6	5	6	12	16
12	13	25	196	52	136	26	11	6	4	6	13	16
13	13	25	204	60	136	26	10	6	4	8	14	16
14	12	20	236	60	136	26	10	6	4	8	12	15
15	11	20	236	52	130	24	10	6	4	10	14	16
16	10	20	254	52	124	24	10	6	6	10	14	16
17	8	18	124	52	104	24	10	5	6	11	14	16
18	8	15	136	60	99	24	9	5	6	11	14	16
19	10	15	148	68	84	24	9	4	6	11	14	16
20	15	15	220	80	84	24	9	4	6	11	14	16
21	25	15	204	76	84	24	8	4	6	11	16	14
22	30	15	148	76	80	22	8	4	6	11	16	14
23	55	15	124	78	76	21	8	4	6	11	16	14
24	131	15	94	84	72	20	8	4	6	11	16	14
25	114	15	89	94	68	18	8	4	6	11	16	14
26	76	15	84	124	64	18	8	5	6	12	16	14
27	42	15	76	114	60	18	8	5	6	12	18	16
28	39	20	68	84	56	17	8	5	6	12	18	16
29	39	.....	64	76	52	17	8	6	6	12	18	14
30	39	.....	60	72	48	17	8	6	6	12	18	14
31	52	.....	56	.....	44	.....	8	6	.....	12	.....	14

NOTE.—Daily discharge Jan. 1 to Feb. 28 determined from a rating curve well defined below 70 second-feet nd practically the same as the 1909 curve. Discharge Mar. 1 to Dec. 31 determined from a rating curve vell defined below 200 second-feet. Discharge May 22 to 31 interpolated.

Monthly discharge of South Fork of Atanum Creek near Tampico, Wash., for 1910.

[Drainage area, 28 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
anuary	131	8	28.7	1.02	1.18	1,760	C.
ebruary	42	15	22.8	.814	.85	1,270	C.
arch	362	56	145	5.18	5.97	8,920	C.
pril	124	38	63.4	2.26	2.52	3,770	B.
ay	148	44	86.9	3.10	3.57	5,340	C.
ne	42	17	26.3	.939	1.05	1,560	B.
ly	16	8	10.7	.382	.44	658	B.
ugust	8	4	5.8	.207	.24	357	B.
eptember	6	4	5.6	.200	.22	333	B.
ctober	12	6	9.0	.321	.37	553	B.
ovember	18	12	14.2	.507	.57	845	B.
ecember	18	14	15.7	.561	.65	965	B.
The year	362	4	36.4	1.30	17.63	26,300	

TOPPENISH CREEK BASIN.

GENERAL FEATURES.

Toppenish Creek, which drains the northern part of the Yakima Indian Reservation, enters Yakima River from the west about 25 miles below the mouth of Atanum Creek. The western half of the basin lies in the foothills of the Cascades and is fairly well forested. After leaving the hills the stream spreads into innumerable sloughs, and it is almost impossible to find a point where all its flow can be measured. About 10 miles below the foot of the hills it is joined on the right bank by Simcoe Creek, its principal tributary. About 3 miles west of Alfalfa it receives the waters of a considerable by-channel of Yakima River known as Wanita Slough.

A few small ditches divert water from both Toppenish and Simcoe creeks near White Swan for irrigation, but their total flow is not large. The United States Indian Service proposes to divert flood water from Toppenish Creek to a reservoir on Simcoe Creek using the water for irrigating the Wapato Valley. A private concern also proposes diverting from the Diamond Fork of the Klickitat into Toppenish Creek, using the water for irrigation near Fort Simcoe.

Records have not yet been kept for a sufficiently long period to properly determine the cycle of wet and dry years.

TOPPENISH CREEK NEAR FORT SIMCOE, WASH.

This station, which is located 3 miles east and about 1 mile south of Fort Simcoe, 1 mile below the highway bridge in sec. 26, T. 10 N., R. 16 E., was established February 27, 1909. The station is about 8 miles above Simcoe Creek.

The gage is of the chain and weight type and is attached to a cantilever beam 8 feet downstream from the measuring section on the right bank. No change has been made in gage datum.

The right bank is high and rocky and not liable to overflow. The left bank is low and will overflow at high stages. The bed of the stream is of gravel and cobblestones, and fairly permanent.

Discharge measurements are made from a cable or by wading.

There is occasionally floating ice in the stream, but the presence of this ice does not seem to materially affect the gage heights. The gage-height record is somewhat fragmentary, and the record as a whole is only fair.

Discharge measurements of Toppenish Creek near Fort Simcoe, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 24	McGlashan and Kimble	45	100	3.50	639
Apr. 19	H. D. McGlashan	36	57	2.55	333
May 23	do	27	22	1.13	72.8
Aug. 8[a]	McGlashan and Storey	11	12.9	0.63	14.2

[a] Made by wading.

Daily gage height, in feet, of Toppenish Creek near Fort Simcoe, Wash., for 1910.

[R. Harbaugh, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.62	2.12	3.34		2.01	0.96		0.76	0.62		0.79	1.00
2		2.02	4.35		1.83		0.82	.76			.81	1.00
3	1.62	1.92	5.21		1.82	.96	.82		.62	0.75	.83	1.02
4	1.62	1.92	5.01		1.80		.82	.65			.84	1.40
5	1.62	1.92	4.86		1.80	.97	.82		.62	.75	.80	1.38
6	1.62	1.92	4.72	2.92	1.74						.79	1.45
7	1.62	1.82	4.62	2.82	1.72			.64	.62	.76	.84	1.43
8	1.56	1.72	4.60	2.84	1.72		.76				.89	1.40
9	1.42	1.72	4.32	2.80	1.62				.62	.80	.89	1.38
10	1.42	1.70	4.32	2.84	1.60	.96				.80	.98	1.30
11	1.22	1.72	4.20	2.82	1.60		.76		.62		1.04	1.30
12	1.22	1.72	4.10	2.76	1.60	.97				.80	1.00	1.26
13	1.20	1.72	3.82	2.72	1.54	.97			.62		.92	1.20
14	1.20	1.70	3.72	2.72				.65	.62	.80	.90	1.20
15		1.62		2.76	1.52		.75	.66		.76	.89	1.10
16	1.22	1.62		2.72	1.52	.86		.67	.72	.76	.85	1.10
17	1.42	1.62	3.96	2.82	1.50	.86	.76	.64	.73	.75	.85	1.05
18	1.42	1.60	4.12	2.76	1.50					.75	.84	1.00
19	1.72	1.60	4.32		1.40			.63	.73	.75	.84	.98
20	1.92	1.60	4.44		1.40	.85		.62		.75	.86	.95
21	2.42	1.60	4.62		1.32	.86	.76	.61	.73		1.00	.95
22	2.52		4.07	2.62			.76			.74	1.30	.96
23	2.56			2.64		.86		.61	.73	.74	1.20	.95
24	2.62	1.62	3.57	2.52						.74	1.10	.95
25	2.62	1.62	3.01	2.42					.73	.74	1.00	1.00
26	2.52	1.74	2.92	2.42	1.12	.85		.62		.74	.98	.98
27		1.79	2.92	2.30	1.10				.73	.75	1.00	.95
28	2.42	2.52	2.82	2.06		.84	.76	.62	.73	.75	1.00	.98
29	2.45		2.62		1.10				.74	.77	.98	.96
30			2.50	2.04		.83	.76	.62	.76	.76	1.00	.98
31	2.24		2.42		1.10					.77		.95

NOTE.—Probably some ice during January and the early part of February; gage heights apparently not materially affected.

Daily discharge, in second-feet, of Toppenish Creek near Fort Simcoe, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	127	230	591	331	204	41	30	24	13	24	26	45
2	127	207	914	356	165	41	29	24	13	23	28	45
3	127	184	1,190	381	162	41	29	20	13	23	30	47
4	127	184	1,120	406	158	42	29	16	13	23	31	93
5	127	184	1,080	431	158	42	29	16	13	23	27	90
6	127	184	1,030	456	147	42	27	15	13	24	26	100
7	127	162	1,000	424	144	42	26	15	13	24	31	98
8	118	144	994	431	144	41	24	15	13	26	35	93
9	96	144	904	418	128	41	24	15	13	27	35	90
10	96	140	904	431	124	41	24	15	13	27	43	79
11	69	144	866	424	124	41	24	16	13	27	49	79
12	69	144	834	406	124	42	24	16	13	27	45	74
13	67	144	744	394	114	42	24	16	13	27	38	67
14	67	140	712	394	114	38	23	16	13	27	36	67
15	68	127	738	406	111	36	23	16	17	24	35	56
16	69	127	763	394	111	32	23	17	21	24	32	56
17	96	127	789	424	108	32	24	15	21	23	32	50
18	96	124	840	406	108	32	24	14	21	23	31	45
19	144	124	904	396	93	32	24	14	21	23	31	43
20	184	124	943	390	93	32	24	13	21	23	32	40
21	306	124	1,000	384	82	32	24	13	21	22	45	40
22	334	125	824	364	78	32	24	13	21	22	79	42
23	346	126	744	370	72	32	24	13	21	22	67	40
24	364	127	664	334	68	32	24	13	21	22	56	40
25	364	127	485	306	62	32	24	13	21	22	45	45
26	334	147	456	306	58	32	24	13	21	22	43	43
27	320	156	456	274	56	31	24	13	21	23	45	40
28	306	334	424	216	56	31	24	13	21	23	45	43
29	314	.....	364	214	56	30	24	13	22	25	43	41
30	286	.....	328	211	56	30	24	13	24	24	45	43
31	258	.....	306	.....	56	.....	24	13	.....	25	.....	40

NOTE.—Daily discharge determined from a rating curve fairly well defined below 700 second-feet. The accuracy of the monthly estimates is reduced by a lapse in the gage records and the poor condition at the station.

Monthly discharge of Toppenish Creek near Fort Simcoe, Wash., for 1910.

[Drainage area, 135 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total acre-feet.	
January	364	67	183	1.36	1.57	11,300	C.
February	334	124	155	1.16	1.21	8,660	C.
March	1,190	306	771	5.71	6.58	47,400	C.
April	456	211	369	2.73	3.05	22,000	C.
May	204	56	108	.800	.92	6,640	C.
June	42	30	36.2	.268	.30	2,150	C.
July	30	23	24.9	.184	.21	1,530	C.
August	24	13	15.2	.113	.13	935	C.
September	24	13	17.2	.128	.14	1,030	C.
October	27	22	24.0	.178	.21	1,480	C.
November	79	26	39.5	.293	.33	2,350	C.
December	100	40	58.5	.433	.50	3,600	B.
The year	1,190	13	150	1.11	15.15	109,000	

TOPPENISH CREEK NEAR WHITE SWAN, WASH.[1]

This station, which is located about 5 miles south and 9 miles west of Wapato and 1,000 feet below the mouth of Simcoe Creek, was established March 10, 1909, to replace a station 10 miles downstream from this point, formerly designated "Toppenish Creek near Toppenish."

[1] This station was called "Toppenish Creek near Wapato" in the 1909 report.

The gage is of the chain-and-weight type and is fastened to a cantilever beam on the left bank. It is read twice daily. Its datum has not been changed.

The banks of the stream are comparatively high, but are subject to overflow at high stages. They were covered with a thick growth of willows and brush which was cleared out in October, 1910. The bed of the stream is of sand and is liable to change somewhat during medium and high stages.

Discharge measurements are made from a cable 200 feet below the gage.

The accuracy of the record as a whole is somewhat reduced by the fact that, owing to the irregularity of the flow, the mean height for the day can not be accurately determined from one reading.

Discharge measurements of Toppenish Creek near White Swan, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft*
Mar. 23	McGlashan and Kimble	73	650	16.72	1,100
Apr. 19	H. D. McGlashan	30	228	8.51	431
May 23	.....do	27	78.1	3.29	105
Aug. 8	McGlashan and Storey	23	38.7	1.55	14.3
Oct. 12	F. B. Storey	23	40.1	1.45	8.8

Daily gage height, in feet, of Toppenish Creek near White Swan, Wash., for 1910.

[Chas. Macy, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	9.6	11.3	9.8	6.6	2.8	2.4	2.1	1.5	1.5	1.5	1.65
2	.....	8.3	18.4	9.8	6.4	2.8	2.3	2.1	1.5	1.5	1.5	1.65
3	.....	7.9	20.5	9.8	6.0	2.8	2.3	2.1	1.5	1.5	1.5	1.65
4	.....	7.3	18.9	9.8	6.0	2.8	2.3	2.0	1.5	1.5	1.5	1.7
5	.....	6.9	17.6	9.8	5.9	2.8	2.3	1.9	1.5	1.5	1.5	1.7
6	.....	6.5	15.3	9.8	5.8	2.7	2.3	1.8	1.5	1.5	1.5	1.7
7	.....	6.3	14.7	9.8	5.6	2.7	2.3	1.8	1.5	1.5	1.5	1.7
8	.....	6.1	13.1	9.8	5.4	2.7	2.3	1.8	1.5	1.5	1.5	1.7
9	.....	5.9	12.3	9.8	5.3	2.5	2.3	1.8	1.5	1.5	1.5	1.7
10	.....	5.6	11.9	9.8	5.2	2.4	2.2	1.8	1.5	1.5	1.5	1.7
11	.....	5.4	11.6	9.7	5.2	2.4	2.2	1.7	1.5	1.5	1.5	1.7
12	.....	5.4	12.0	9.6	4.9	2.3	2.2	1.7	1.5	1.5	1.5	1.7
13	.....	5.5	12.6	9.6	4.8	2.3	2.2	1.6	1.5	1.5	1.5	1.75
14	.....	6.2	13.2	9.5	4.6	2.3	2.1	1.6	1.5	1.5	1.5	1.75
15	.....	5.8	14.3	9.1	4.3	2.3	2.1	1.5	1.5	1.5	1.5	1.8
16	.....	5.5	14.5	8.7	4.3	2.3	2.1	1.5	1.5	1.5	1.5	1.8
17	.....	5.4	15.9	8.4	4.1	2.3	2.1	1.5	1.5	1.5	1.5	1.85
18	.....	5.3	16.4	8.1	3.9	2.3	2.1	1.5	1.5	1.5	1.5	1.85
19	.....	5.0	16.6	8.5	3.8	2.3	2.0	1.5	1.5	1.5	1.5	1.9
20	.....	5.0	17.1	8.9	3.6	2.6	2.0	1.5	1.5	1.5	1.5	1.9
21	.....	5.0	17.4	9.2	3.5	2.6	2.1	1.5	1.5	1.5	1.5	1.9
22	4.3	4.9	17.1	8.8	3.4	2.6	2.2	1.5	1.5	1.5	1.55	1.9
23	8.8	4.7	16.6	8.6	3.4	2.6	2.3	1.5	1.5	1.5	1.55	1.9
24	13.4	5.0	15.4	8.4	3.3	2.5	3.3	1.5	1.5	1.5	1.55	1.9
25	13.7	5.0	14.4	8.2	3.1	2.5	2.3	1.5	1.5	1.5	1.55	1.9
26	13.1	5.4	13.6	8.0	3.0	2.5	2.2	1.5	1.5	1.5	1.55	1.9
27	11.9	9.3	12.4	7.6	3.0	2.4	2.2	1.5	1.5	1.5	1.6	1.9
28	10.4	11.4	11.6	7.1	3.0	2.4	2.2	1.5	1.5	1.5	1.6	1.9
29	9.2	.....	10.9	7.0	2.9	2.4	2.2	1.5	1.5	1.6	1.6	1.9
30	8.4	.....	10.3	6.9	2.9	2.4	2.2	1.5	1.5	1.5	1.6	2.0
31	9.4	.....	9.8	.....	2.9	.....	2.1	1.5	.....	1.5	.....	2.0

NOTE.—Creek frozen Jan. 1 to 22. Readings for this period omitted because of errors of observation.

Daily discharge, in second-feet, of Toppenish Creek near White Swan, Wash, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	509	639	523	302	76	56	41	11	11	11	18
2	.....	418	1,260	523	290	76	51	41	11	11	11	18
3	.....	390	1,440	523	266	76	51	41	11	11	11	18
4	.....	348	1,300	523	266	76	51	36	11	11	11	21
5	.....	320	1,180	523	260	76	51	31	11	11	11	21
6	.....	296	977	523	254	71	51	26	11	11	11	21
7	.....	284	923	523	242	71	51	26	11	11	11	21
8	.....	272	783	523	230	71	51	26	11	11	11	21
9	.....	260	719	523	224	61	51	26	11	11	11	21
10	.....	242	687	523	218	56	46	26	11	11	11	21
11	.....	230	663	516	218	56	46	21	11	11	11	21
12	.....	230	695	509	200	51	46	21	11	11	11	21
13	.....	236	743	509	194	51	46	16	11	11	11	24
14	.....	278	791	502	182	51	41	16	11	11	11	24
15	.....	254	887	474	164	51	41	11	11	11	11	26
16	.....	236	905	446	164	51	41	11	11	11	11	26
17	.....	230	1,030	425	152	51	41	11	11	11	11	28
18	.....	224	1,080	404	140	51	41	11	11	11	11	28
19	.....	206	1,090	432	134	51	36	11	11	11	11	31
20	.....	206	1,140	460	122	66	36	11	11	11	11	31
21	.....	206	1,170	481	116	66	41	11	11	11	11	31
22	164	200	1,140	453	110	66	46	11	11	11	14	31
23	453	188	1,090	439	110	66	51	11	11	11	14	31
24	807	206	986	425	104	61	51	11	11	11	14	31
25	833	206	896	411	92	61	51	11	11	11	14	31
26	783	230	824	397	86	61	46	11	11	11	14	31
27	687	488	727	369	86	56	46	11	11	11	16	31
28	567	647	663	334	86	56	46	11	11	11	16	31
29	481	.....	607	327	81	56	46	11	11	11	16	31
30	425	.....	559	320	81	56	46	11	11	11	16	36
31	495	.....	523	.....	81	.....	41	11	.....	11	.....	36

NOTE.—Daily discharge determined from a fairly well defined rating curve.

Monthly discharge of Toppenish Creek near White Swan, Wash., for 1910.

[Drainage area, 416 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January 22-31	833	164	570	1.37	0.51	11,300	C.
February	647	188	287	.689	.72	15,900	B.
March	1,440	523	907	2.18	2.51	55,800	B.
April	523	320	462	1.11	1.24	27,500	B.
May	302	81	170	.409	.47	10,500	B.
June	76	51	61.5	.148	.17	3,660	B.
July	56	36	46.3	.111	.13	2,850	B.
August	41	11	18.7	.045	.05	1,150	B.
September	11	11	11	.026	.03	655	B.
October	11	11	11	.026	.03	676	B.
November	16	11	12.2	.029	.03	726	B.
December	36	18	26.2	.063	.07	1,610	B.
The period	.....	.....	.....	.....	.....	132,000	

TOPPENISH CREEK AT ALFALFA, WASH.

This station, which is located at the highway bridge 300 feet above the Northern Pacific Railway crossing, one-half mile east of Alfalfa, Wash., and a short distance above the mouth of the stream, was established March 6, 1909.

The drainage area is 560 square miles.

The gage is a vertical staff on the downstream side of the bridge from which measurements are made.

The banks of the stream are comparatively low and will overflow in extreme high water. The bed of the stream is rocky and subject to slight change during freshets.

A considerable part of the water measured at this station leaves Yakima River just below Sunnyside dam and flows through Wanita Slough into Toppenish Creek about 4 miles west of the station. The determined discharge is therefore at times much in excess of the natural flow.

Discharge measurements of Toppenish Creek at Alfalfa, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 25[a]	McGlashan and Kimble	176	878	4.36	1,470
Apr. 22	H. D. McGlashan	45	130	2.30	502
May 30	do	23	83	1.45	197
July 14	McGlashan and Storey	22	70.7	.78	70.3
14	F. B. Storey	22	70	.78	70

[a] Measured from N. P. R. R. bridge.

Daily gage height, in feet, of Toppenish Creek at Alfalfa, Wash., for 1910.

[Preston Myers, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	2.7	3.0	2.9	2.3	1.4	0.8	0.6	0.8	0.9	0.9	1.7
2	1.8	2.8	3.5	2.7	2.2	1.3	.7	.6	.8	.8	.9	1.6
3	1.9	2.7	3.8	2.7	2.2	1.2	.7	.7	.8	.8	.9	1.6
4	1.9	2.6	4.0	2.5	2.1	1.2	.7	.6	.7	.8	1.0	1.6
5	2.0	2.5	4.5	2.4	2.1	1.3	.7	.6	.8	.9	1.0	1.7
6	2.1	2.4	4.0	2.3	2.0	1.3	.7	.6	.8	.9	.9	1.6
7	1.6	2.2	3.9	2.3	2.0	1.2	.7	.5	.7	.9	.8	1.6
8	1.5	2.3	3.7	2.0	2.0	1.2	.7	.4	.7	.9	.9	1.6
9	1.5	2.3	3.5	2.0	1.9	1.2	.7	.5	.8	.9	.8	1.5
10	1.4	2.2	3.0	2.2	1.8	1.1	.7	.5	.8	.9	.8	1.5
11	1.5	2.1	2.9	2.3	1.9	1.1	.7	.5	.7	.9	.9	1.5
12	1.4	2.0	2.7	2.4	1.9	1.0	.7	.5	.7	.9	.9	1.5
13	1.5	2.1	2.9	2.4	1.9	1.0	.7	.6	.7	.8	.9	1.4
14	1.5	2.1	3.0	2.5	1.85	1.0	.7	.5	.7	.9	.9	1.5
15	1.4	2.2	3.1	2.4	1.8	1.0	.6	.5	.6	.9	.9	1.5
16	1.2	2.2	3.2	2.4	1.8	1.1	.6	.6	.6	.9	1.0	1.5
17	1.5	2.2	3.3	2.4	1.7	1.2	.7	.6	.6	.9	1.1	1.5
18	1.6	2.1	3.5	2.4	1.6	1.1	.6	.5	.7	.9	1.2	1.5
19	1.8	2.3	3.6	2.3	1.6	1.0	.6	.5	.7	.8	1.3	1.5
20	1.9	2.4	4.2	2.3	1.5	.9	.7	.6	.7	.9	1.2	1.5
21	2.1	2.3	4.5	2.3	1.4	.9	.7	.6	.8	.8	1.3	1.5
22	2.6	2.2	4.6	2.2	1.5	.9	.6	.6	.8	.9	1.4	1.5
23	2.5	2.1	4.6	2.2	1.5	1.0	.6	.5	.8	.9	1.4	1.5
24	2.8	2.2	4.5	2.3	1.5	1.0	.7	.6	.8	.9	1.5	1.5
25	2.9	2.3	4.2	2.4	1.5	.9	.7	.6	.8	.9	1.6	1.5
26	3.0	2.2	4.1	2.4	1.5	.9	.8	.7	.8	.9	1.6	1.5
27	4.0	2.5	3.8	2.4	1.5	.9	.7	.8	.8	.8	1.7	1.4
28	3.5	2.8	3.5	2.4	1.5	.9	.7	.7	.9	.9	1.7	1.4
29	3.0	.....	3.4	2.5	1.5	.8	.7	.8	.9	.9	1.8	1.4
30	3.0	.....	3.3	2.5	1.5	.8	.7	.7	.9	.9	1.8	1.4
31	2.9	.....	3.1	.....	1.5	.....	.6	.8	.....	.9	.....	1.4

NOTE.—No ice reported at this station.

Daily discharge, in second-feet, of Toppenish Creek at Alfalfa, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	270	678	815	769	501	184	72	46	72	86	86	270
2	304	723	1,050	678	460	160	59	46	72	72	86	238
3	340	678	1,200	678	460	139	59	59	72	72	86	238
4	340	633	1,300	588	420	139	59	46	59	72	103	238
5	380	588	1,550	544	420	160	59	46	72	86	103	270
6	420	544	1,300	501	380	160	59	46	72	86	86	238
7	238	460	1,250	501	380	139	59	36	59	86	72	238
8	210	501	1,150	380	380	139	59	28	59	86	86	238
9	210	501	1,050	380	340	139	59	36	72	86	72	210
10	184	460	815	460	304	120	59	36	72	86	72	210
11	210	420	769	501	340	120	59	36	59	86	86	210
12	184	380	678	544	340	103	59	36	59	86	86	210
13	210	420	769	544	340	103	59	46	59	72	86	184
14	210	420	815	588	322	103	59	36	59	86	86	210
15	184	460	861	544	304	103	46	36	46	86	86	210
16	139	460	907	544	304	120	46	46	46	86	103	210
17	210	460	953	544	270	139	59	46	46	86	120	210
18	238	420	1,050	544	238	120	46	36	59	86	139	210
19	304	501	1,100	501	238	103	46	36	59	72	160	210
20	340	544	1,400	501	210	86	59	46	59	86	139	210
21	420	501	1,550	501	184	86	59	46	72	72	160	210
22	633	460	1,600	460	210	86	46	46	72	86	184	210
23	588	420	1,600	460	210	103	46	36	72	86	184	210
24	723	460	1,550	501	210	103	59	46	72	86	210	210
25	769	501	1,400	544	210	86	59	46	72	86	238	210
26	815	460	1,350	544	210	86	72	59	72	86	238	210
27	1,300	588	1,200	544	210	86	59	72	72	72	270	184
28	1,050	723	1,050	544	210	86	59	59	86	86	270	184
29	815	.....	1,000	588	210	72	59	72	86	86	304	184
30	815	.....	953	588	210	72	59	59	86	86	304	184
31	769	.....	861	.....	210	.....	46	72	.....	86	.....	184

NOTE.—Daily discharge determined from a rating curve well defined between 50 and 1,500 second-feet. The accuracy of the results is materially reduced by the uncertainty of the observer's records. The flow measured at this station includes a considerable amount of water from Yakima River as well as return waters from irrigation.

Monthly discharge of Toppenish Creek at Alfalfa, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	1,300	139	446	27,400	B.
February	723	380	513	28,500	B.
March	1,600	678	1,130	69,500	B.
April	769	380	537	32,000	B.
May	501	184	298	18,300	B.
June	184	72	115	6,840	B.
July	72	46	56.9	3,500	B.
August	72	28	46.4	2,850	B.
September	86	46	66.5	3,960	B.
October	86	72	82.8	5,090	B.
November	304	72	144	8,570	B.
December	270	184	214	13,200	B.
The year	1,600	28	303	220,000	

SIMCOE CREEK NEAR FORT SIMCOE, WASH.

This station, which is located 3 miles north and 2 miles east o Fort Simcoe, Wash., in sec. 34, T. 11 N., R. 16 E., at the site for a proposed dam, was established February 28, 1909.

The chain gage used in 1909 was replaced in March, 1910, by staff gage at the same datum. The banks of the stream are low an

liable to overflow during high water. The bed is composed of gravel and sand and is liable to change during freshets.

Discharge measurements are made from a foot log.

Discharge measurements of Simcoe Creek near Fort Simcoe, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 24	McGlashan and Kimble	24	62	3.38	272
Apr. 20	H. D. McGlashan	22	40	2.58	126
May 24	do	22	17.6	1.56	22.9
Aug. 9[a]	McGlashan and Storey	9.5	2.2	1.11	.93
Aug. 9[a]	do	7.3	2.1	1.11	1.01

[a] Made by wading.

Daily gage height, in feet, of Simcoe Creek near Fort Simcoe, Wash., for 1910.

[Parchese Wolloock, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	2.4	6.3	2.4	2.3	1.4	1.3	1.2	1.0	1.0	1.2	1.3
2	1.6	2.3	6.5	2.4	2.3	1.3	1.3	1.1	1.0	1.0	1.2	1.3
3	1.5	2.3	6.0	2.4	2.2	1.2	1.3	1.1	1.0	1.1	1.2	1.3
4	1.6	2.2	.....	2.4	2.2	1.2	1.3	1.1	1.0	1.1	1.2	1.3
5	1.4	2.1	4.3	2.4	2.1	1.3	1.2	1.1	1.0	1.1	1.2	1.4
6	1.5	2.2	4.0	2.4	2.1	1.3	1.2	1.1	1.0	1.1	1.2	1.4
7	1.4	2.1	3.6	2.3	2.1	1.3	1.2	1.1	1.0	1.1	1.2	1.4
8	1.5	1.9	3.0	2.3	2.1	1.3	1.2	1.1	1.0	1.1	1.3	1.4
9	1.5	2.0	.....	2.3	2.0	1.3	1.2	1.1	1.0	1.1	1.3	1.4
10	1.4	1.8	3.0	2.3	2.0	1.3	1.2	1.1	1.0	1.1	1.3	1.4
11	1.5	1.9	3.1	2.4	2.0	1.3	1.2	1.1	1.0	1.1	1.3	1.4
12	1.4	1.9	3.1	2.4	2.0	1.3	1.2	1.1	1.0	1.1	1.3	1.4
13	1.5	1.8	3.1	2.5	1.9	1.3	1.2	1.1	1.0	1.1	1.3	1.4
14	1.5	1.9	3.3	2.5	1.9	1.3	1.2	1.1	1.0	1.1	1.3	1.4
15	1.4	1.8	3.4	2.5	1.9	1.3	1.2	1.1	1.0	1.1	1.3	1.4
16	1.5	1.9	3.5	2.5	1.9	1.3	1.2	1.1	1.0	1.1	1.3	1.4
17	1.4	1.9	3.6	2.5	1.8	1.3	1.2	1.1	1.0	1.1	1.3	1.4
18	1.5	1.8	3.5	2.6	1.8	1.3	1.2	1.0	1.0	1.2	1.3	1.4
19	3.4	1.9	3.6	2.6	1.7	1.3	1.2	1.0	1.0	1.2	1.3	1.4
20	2.5	1.8	3.6	2.6	1.7	1.3	1.2	1.0	1.0	1.2	1.3	1.3
21	2.1	1.9	5.0	2.5	1.6	1.3	1.2	1.0	1.0	1.2	1.3	1.3
22	1.8	1.7	4.1	2.5	1.6	1.3	1.2	1.0	1.0	1.2	1.3	1.3
23	.....	1.7	3.6	2.5	1.6	1.3	1.2	1.0	1.0	1.2	1.3	1.3
24	5.7	1.6	3.4	2.5	1.6	1.3	1.2	1.0	1.0	1.2	1.3	1.3
25	5.2	1.8	3.2	2.5	1.6	1.3	1.2	1.0	1.0	1.2	1.3	1.3
26	4.1	1.7	3.0	2.6	1.6	1.3	1.2	1.0	1.0	1.2	1.3	1.3
27	2.7	2.7	2.9	2.6	1.6	1.3	1.2	1.0	1.0	1.2	1.3	1.3
28	2.6	2.7	2.7	2.5	1.6	1.3	1.2	1.0	1.0	1.2	1.3	1.3
29	2.6	.....	2.6	2.4	1.6	1.3	1.2	1.0	1.0	1.2	1.3	1.3
30	2.4	.....	2.5	2.3	.....	1.3	1.2	1.0	1.0	1.2	1.3	1.3
31	2.5	.....	2.5	.....	.....	.....	1.2	1.0	.....	1.2	.....	1.3

NOTE.—No ice reported.

Daily discharge, in second-feet, of Simcoe Creek near Fort Simcoe, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	33	101	1,240	101	89	13	8	4	0.2	0.2	4	8
2	25	89	1,340	101	89	8	8	1	.2	.2	4	8
3	19	89	1,100	101	78	4	8	1	.2	1	4	8
4	25	78	800	101	78	4	8	1	.2	1	4	8
5	13	68	490	101	68	8	4	1	.2	1	4	13
6	19	78	414	101	68	8	4	1	.2	1	4	13
7	13	68	320	89	68	8	4	1	.2	1	4	13
8	19	49	195	89	68	8	4	1	.2	1	8	13
9	19	58	195	89	58	8	4	1	.2	1	8	13
10	13	41	195	89	58	8	4	1	.2	1	8	13
11	19	49	214	101	58	8	4	1	.2	1	8	13
12	13	49	214	101	58	8	4	1	.2	1	8	13
13	19	41	214	114	49	8	4	1	.2	1	8	13
14	19	49	255	114	49	8	4	1	.2	1	8	13
15	13	41	276	114	49	8	4	1	.2	1	8	13
16	19	49	298	114	49	8	4	1	.2	1	8	13
17	13	49	320	114	41	8	4	1	.2	1	8	13
18	19	41	298	129	41	8	4	4	.2	4	8	13
19	276	49	320	129	33	8	4	0.2	.2	4	8	13
20	114	41	320	129	33	8	4	.2	.2	4	8	8
21	68	49	693	114	25	8	4	.2	.2	4	8	8
22	41	33	439	114	25	8	4	.2	.2	4	8	8
23	499	33	320	114	25	8	4	.2	.2	4	8	8
24	957	25	276	114	25	8	4	.2	.2	4	8	8
25	762	41	234	114	25	8	4	.2	.2	4	8	8
26	439	33	195	129	25	8	4	.2	.2	4	8	8
27	144	144	177	129	25	8	4	.2	.2	4	8	8
28	129	144	144	114	25	8	4	.2	.2	4	8	8
29	129	.....	129	101	25	8	4	.2	.2	4	8	8
30	101	.....	114	89	21	8	4	.2	.2	4	8	8
31	114	.....	114	.....	17	.....	4	.2	.....	4	.....	8

NOTE.—Daily discharge determined from a rating curve fairly well defined below 400 second-feet.

Monthly discharge of Simcoe Creek near Fort Simcoe, Wash., for 1910.

[Drainage area, 80 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	957	13	132	1.65	1.90	8,120	C.
February	144	25	60	.75	.78	3,330	B.
March	1,340	114	382	4.78	5.51	23,500	C.
April	129	89	108	1.35	1.51	6,430	B.
May	89	17	46.6	.582	.67	2,870	B.
June	13	4	7.9	.099	.11	470	B.
July	8	4	4.5	.056	.06	277	B.
August	4	0.2	.74	.0092	.01	46	B.
September	0.2	.2	.2	.0025	.003	12	B.
October	4	.2	2.3	.029	.03	141	B.
November	8	4	7.1	.089	.10	422	B.
December	13	8	10.4	.130	.15	640	B.
The year	1,340	.2	64	.800	10.83	46,300	

SATUS CREEK BASIN.

Satus Creek drains the southern part of the Yakima Indian Reservation and unites with Yakima River about 8 miles below the mouth of Toppenish Creek. The drainage area of Satus Creek at its mouth is about 600 square miles.

SATUS CREEK NEAR TOPPENISH, WASH.

This gaging station, which is located a short distance above the mouth of Dry Creek, about 1,000 feet below the public highway and ford, 4 miles west and 10 miles south of Toppenish, Wash., was established November 8, 1908.

The gage is a vertical staff in two sections, located about 150 feet above the measuring section, a short distance above a rifle control, and a stable relation between gage heights and discharge can probably be determined. Owing, however, to its isolated location, only weekly readings have been obtained.

Discharge measurements are made from a cable.

Discharge measurements of Satus Creek near Toppenish, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 20	H. D. McGlashan	53	70.6	1.50	149
Aug. 11	F. B. Storey	44	36.6	.73	18.7
24[a]	do	22	14.6	.69	15.9
24[a]	R. H. Bolster	22	14	.70	16.3

[a] Not at regular station.

Daily gage height, in feet, of Satus Creek near Toppenish, Wash., for 1910.

[H. L. Jensen, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					1.7							
2	1.0									0.8		
3				1.9			0.9					
4									0.8			1.7
5												
6		1.7	2.8								0.9	
7						1.2		0.7				
8					1.9							
9	1.6									.8		
10				1.8			.9					
11									.7			1.6
12						1.1						
13		1.6	2.1								1.0	
14								.7				
15					1.6							
16	1.1									.85		
17				1.8			.8					
18									.75			1.2
19						1.05						
20		1.5	2.7								1.0	
21								.6				
22					1.4					.9		
23	5.0											
24				1.9								
25		2.7				1.0	.8		.8			1.3
26												
27		2.7	2.0								1.3	
28								.7				
29					1.4							
30	2.0									.9		
31							.8					

NOTE.—No ice reported except on Feb. 20; high reading of Jan. 23 possibly may have been caused by ice obstruction, although high stages were general about that time.

Daily discharge, in second-feet, of Satus Creek near Toppenish, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	49	246	1,970	246	190	98	36	25	25	25	36	141
2	49	216	2,360	246	190	98	36	25	25	25	36	165
3	64	203	1,340	246	216	98	36	25	25	25	36	165
4	80	190	1,020	246	216	80	36	16	25	25	36	190
5	89	190	720	246	216	80	36	16	25	25	36	190
6	108	190	610	246	246	80	36	16	25	25	36	190
7	119	165	560	216	246	80	36	16	25	25	36	190
8	141	165	515	216	246	80	36	16	16	25	36	190
9	165	165	470	216	216	80	36	16	16	25	36	165
10	141	165	430	216	216	64	36	16	16	25	36	165
11	98	165	390	216	190	64	36	19	16	25	49	165
12	64	165	350	216	190	64	36	16	16	25	49	165
13	64	165	310	216	165	64	36	16	16	25	49	165
14	64	165	310	216	165	64	25	16	16	25	49	119
15	64	141	350	216	165	64	25	16	16	25	49	119
16	64	141	390	216	165	64	25	16	16	30	49	80
17	89	141	430	216	141	64	25	16	16	36	49	80
18	130	141	470	216	141	64	25	11	20	36	49	80
19	190	141	515	216	141	57	25	11	16	36	49	80
20	277	141	560	216	141	49	25	11	16	36	49	80
21	390	141	515	246	119	49	25	11	25	36	64	80
22	1,150	141	470	246	119	49	25	11	25	36	64	80
23	1,970	141	430	246	119	49	25	16	25	36	80	80
24	1,650	141	390	246	119	49	25	16	25	36	80	80
25	1,340	560	350	246	119	49	25	16	25	36	98	98
26	1,020	720	310	246	119	49	25	16	25	36	98	98
27	720	560	277	246	119	49	25	16	25	36	98	98
28	720	840	277	216	119	49	25	16	25	36	119	98
29	470	.....	277	216	119	49	25	16	25	36	119	98
30	277	.....	277	216	119	49	25	16	25	36	119	98
31	262	.....	277	.....	119	.....	25	16	.....	36	.....	98

NOTE.—Daily discharge determined from a rating curve fairly well defined below 700 second-feet. Discharge for days between gage readings interpolated with the aid of a hydrograph following the rise and fall of Toppenish Creek near Fort Simcoe.

Monthly discharge of Satus Creek near Toppenish, Wash., for 1910.

[Drainage area, 246 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	1,970	49	390	1.59	1.83	24,000	D.
February	840	141	237	.963	1.00	13,200	C.
March	2,360	277	578	2.35	2.71	35,500	D.
April	246	216	229	.931	1.04	13,600	D.
May	246	119	165	.671	.77	10,100	C.
June	98	49	64.9	.264	.29	3,860	C.
July	36	25	29.6	.120	.14	1,820	C.
August	25	11	16.2	.066	.08	996	C.
September	25	16	21.2	.086	.10	1,260	C.
October	36	25	30.5	.124	.14	1,880	C.
November	119	36	59.6	.242	.27	3,550	C.
December	190	80	125	.508	.59	7,690	C.
The year	2,360	11	162	.660	8.96	117,000	

CANALS IN YAKIMA VALLEY.

GENERAL FEATURES.

About 50 private irrigation canals divert water from Yakima River and its tributaries. These, together with existing Government canals, irrigate approximately 200,000 acres of land and use more than the entire natural flow of Yakima River at low water.

In order to obtain an ample supply during the period of extreme low water, temporary storage dams have been constructed at the outlets of the three Yakima lakes—Keechelus, Kachess, and Clealum. The temporary reservoirs thus formed impound about 80,000 acre-feet of the flood-water flow of the river, and this, when drawn out as needed during the irrigating season, furnishes enough water to supply all the land under existing projects.

Only about one-half of the total irrigable area in the Yakima Valley, however, is now under irrigation ditches. Extensive projects are under way or prospective, by which the United States Reclamation Service proposes to more than double the present irrigated area of the Yakima Valley. To do this the low-water flow of Yakima River must be increased to more than double its present amount, and five large storage dams will be constructed for this purpose. Each of the temporary dams at the three Yakima lakes will be replaced by an immense permanent dam; the large storage dam at Bumping Lake, now completed, and a proposed dam at McAllister Meadows on Tieton River, will also be operated. The combined capacity of the reservoirs formed by these five large dams will aggregate about 800,000 acre-feet. This water, if economically distributed, will water practically all the irrigable area in the Yakima Valley.

These general statements as to the magnitude of the Yakima projects make at once apparent the great importance of hydrographic work in this valley. It is obvious that a systematic study of canal discharge must be maintained here in order to apportion the stored water equitably among users, to procure data which will lead to an economical irrigation duty to determine the loss by seepage and evaporation, and to promote sound engineering in the construction of future systems and units of this system.

The first hydrographic work on private canals in the Yakima Valley was done in 1904. During that year an estimate of discharge was obtained on all the larger canals.[1] This work was continued in 1905, and a diversion duty was settled upon, the rights of private users estimated, and acreage under private projects determined.[2]

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[1] See Water-Supply Paper U. S. Geol. Survey No. 135.
[2] See Water-Supply Paper U. S. Geol. Survey No. 178.

After 1905 the private canal work was practically dropped, although a few miscellaneous measurements were made in 1906. Nothing at all was done in 1907 and 1908.

Owing to large increases in acreage under private and Government canals in the years following 1905, it was found that the records of acreage, duty, and discharge obtained at that time were fast becoming out of date, and that it would be desirable to obtain a continuous record of private canal discharge in order to handle stored waters effectively and apportion the supply equitably among users.

The hydrometric work on the private canals serving Yakima Valley was handled in 1910 by the United States Geological Survey in cooperation with the United States Reclamation Service.

Data pertaining to the most important canals are published in the same manner as those for regular river stations. Data for minor private canals are published in this report in a more condensed form.

A revised list of canals diverting from Yakima and Naches rivers is given below.

Principal irrigating canals diverting from Yakima River.

Canal.	Nearest town.	Headworks.			Bank of river.	Length (miles).
		Section.	Township.	Range.		
KITTITAS VALLEY.						
Cascade	Thorp	28	19 N	17 E	Left	42½
West Kittitas	do	33-34	19 N	17 E	Right	14
Ellensburg Water Co	Ellensburg	12	18 N	17 E	Left	30
Olsen	do	12	18 N	18 E	do	
Bull [a]	do	11	17 N	18 E	do	
YAKIMA-MOXEE VALLEYS.						
Selah-Moxee	Selah	8	14 N	19 E	Left	27
Taylor	do				Right	4½
Moxee Company (includes Moxee and Hubbard).	North Yakima	7	13 N	19 E	Left	8
Fowler	do	18	13 N	19 E	do	
Granger	do	18	13 N	19 E	do	
INDIAN RESERVATION BASIN.						
New reservation	Yakima	17	12 N	19 E	Right	
Old reservation	Wapato	28	12 N	19 E	do	
Sunnyside	do	28	12 N	19 E	Left	61
Gilbert [b]	do				Right	
Piety flat	do	35	12 N	19 E	Left	
Snipes and Allen	do	17	11 N	20 E	do	
LOWER YAKIMA.						
Kiona	Kiona	10	9 N	26 E	Left	9
Kennewick	Richland	3	10 N	27 E	Right	
Lower Yakima	do	3	10 N	27 E	Left	
Amon	do				do	

[a] Diverts from Wilson Creek and tail-race of Ellensburg flour mill.
[b] Diverts from Wanita slough.

Principal irrigating canals diverting from Naches River.

Canal.	Nearest town.	Headworks.			Bank of river.	Length (miles).
		Section.	Township.	Range.		
ABOVE TIETON RIVER.						
Small ditches	Naches					
Selah Valley	do	35	15 N	16 E	Left	20
BETWEEN TIETON RIVER AND COWICHE CREEK.						
Wapatox	Naches	36	15 N	16 E	Left	16
Clarke	do		14 N	17 E	do	
Upper Scott	do	4	14 N	17 E	Right	
Lowery	do		14 N	17 E	Left	
Kelly	do		14 N	17 E	do	
Fortune	do	9	14 N	17 E	Right	
Lower Scott	do	9	14 N	17 E	do	
Basket Ford	do	14	14 N	17 E	do	
Naches Canal Co. (Gleed)	do	24	14 N	17 E	Left	6
Congdon or Yakima Valley	do	24	14 N	17 E	Right	
Naches-Cowiche	North Yakima	9	13 N	18 E	do	7
BELOW COWICHE CREEK.						
Power Canal	North Yakima	10	13 N	18 E	Right	6
Fruitvale Schanno[a]	do	10	13 N	18 E	do	
R. S. & C.[a]	do				do	
Schanno[a]	do	11	13 N	18 E	do	8
Broadgage[a]	do	10	13 N	18 E	do	3
Union	do	11	13 N	18 E	do	8½
North Yakima town	do	12	13 N	18 E	do	
FROM TIETON RIVER.						
Tieton Canal	Naches				Right	

[a] Heads in Yakima power canal.

Power canals diverting from Yakima and Naches rivers.

Canal.	Nearest town.	Headgate.			Bank of river.	Use of power.
		Section.	Township.	Range.		
DIVERTING FROM YAKIMA RIVER.						
Thorp Mill ditch	Thorp	3	18 N	17 E	Right	Sawmill.
Ellensburg city	do	13	18 N	17 E	do	Electricity.
Ellensburg flour mill	Ellensburg	33	18 N	18 E	Left	Flour mill.
Tjossem's mill	Thrall	11	17 N	18 E	do	Do.
Prosser Power Co	Prosser	2	8 N	24 E	do	Pumps, etc.
DIVERTING FROM NACHES RIVER.						
Wapatox Power Co	Naches	36	15 N	16 E	Left	Electric plant.
North Yakima Power Co	North Yakima	10	13 N	18 E	Right	Do.
North Yakima Milling Co	do	(a)	(a)	(a)	(a)	Flour mill.

[a] Heads in power canal.

CANALS TAKING WATER FROM YAKIMA RIVER.

CASCADE CANAL NEAR ELLENSBURG, WASH.

Cascade canal, the first important canal taking water from the Yakima River, heads in the left bank in sec. 28, T. 19 N., R. 17 E., and irrigates about 11,000 acres of hay land in the Kittitas Valley.

This canal has storage rights in the Kachess reservoir which amount to more than the present capacity of the canal during the storage season.

The station was established at the beginning of the irrigating season of 1905, the gage being located at the head gates. It was suspended during 1907 to 1908 and was reestablished about July 1, 1909, in the flume which brings the water through Dudley Gap about 4 miles below the head gate. This gage is below the controlling spill.

Results are highly accurate.

Discharge measurements of Cascade canal near Ellensburg, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 13	H. Kimble	7.9	12.2	1.55	24.7
June 23	do	7.9	24.3	3.07	74.1
Aug. 6	do	7.9	27.8	3.52	89.3

Daily gage height, in feet, and discharge, in second-feet, of Cascade canal near Ellensburg, Wash., for 1910.

[W. S. Mountjoy, observer.]

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	3.25	80	3.35	84	3.55	90	3.50	89	2.25	47
2	.....	.....	3.35	84	3.43	86	3.51	89	3.45	87	2.60	58
3	.....	.....	3.20	79	3.43	86	3.52	89	3.25	80	3.20	79
4	.....	.....	3.30	82	3.40	85	3.51	89	3.38	85	.....	.....
5	.....	.....	3.20	79	3.40	85	3.53	90	3.20	79	.....	.....
6	.....	.....	3.35	84	3.43	87	3.53	90	3.20	79	.....	.....
7	0.33	2.6	3.35	84	3.42	86	3.53	90	3.30	82	.....	.....
8	.33	2.6	3.35	84	3.43	86	3.51	89	3.46	87	.....	.....
9	.68	6.8	3.30	82	3.40	85	3.50	89	3.48	88	.....	.....
10	1.00	12	.....	0	3.40	85	5.51	89	3.42	86	.....	.....
11	1.33	19	.....	0	3.35	84	3.53	90	3.50	89	.....	.....
12	1.42	21	.....	0	3.35	84	3.54	90	3.42	86	.....	.....
13	1.55	25	.....	0	3.42	86	3.52	89	3.40	85	.....	.....
14	.....	0	2.70	62	3.45	87	3.52	89	3.40	85	.....	.....
15	1.65	28	3.05	74	3.40	85	3.52	89	3.45	87	.....	.....
16	1.60	26	3.15	77	3.30	82	3.52	89	3.40	85	.....	.....
17	1.90	35	3.25	80	3.29	82	3.53	90	3.40	85	.....	.....
18	2.15	43	3.05	74	3.20	79	3.52	89	3.23	80	.....	.....
19	2.17	44	2.95	70	3.35	84	3.54	90	3.06	74	.....	.....
20	2.25	47	3.00	72	3.35	84	3.54	90	2.90	68	.....	.....
21	2.35	50	3.00	72	3.45	87	3.52	89	2.91	69	.....	.....
22	2.45	53	3.10	75	3.45	87	3.52	89	2.80	65	.....	.....
23	2.60	58	3.05	74	3.45	87	3.54	90	2.73	63	.....	.....
24	2.70	62	3.08	74	3.45	87	3.53	90	2.66	60	.....	.....
25	2.80	65	3.08	74	3.50	89	3.53	90	2.56	57	.....	.....
26	3.05	74	3.28	81	3.50	89	3.54	90	2.45	53	.....	.....
27	3.10	75	3.30	82	3.47	88	3.54	90	2.37	51	.....	.....
28	3.10	75	3.30	82	3.47	88	.....	0	2.20	45	.....	.....
29	2.95	70	3.35	84	3.45	87	.....	0	2.15	43	.....	.....
30	3.05	74	3.35	84	3.50	89	3.10	75	2.20	45	.....	.....
31	3.20	79	.....	.....	3.49	89	3.40	85	.....	.....	.....	.....

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Cascade canal near Ellensburg, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 7-31	79	0	41.9	2,080	A.
June	84	0	67.6	4,020	A.
July	89	79	85.8	5,280	A.
August	90	0	83.1	5,110	A.
September	89	43	73.9	4,400	A.
October 1-3	79	58	61.3	365	A.
The season	90	0	71.4	21,300	

WEST KITTITAS CANAL NEAR THORP, WASH.

This canal heads in the right bank of the Yakima River in secs. 33 and 34, T. 19 N., R. 17 E., about 3 miles northwest of Thorp. It is controlled by the West Kittitas Irrigation Co., a cooperative association, and irrigates most of the western part of the Kittitas Valley except the lands under Taneum and Manastash creeks.

The station was established at the beginning of the irrigating season of 1904 and maintained during the irrigating seasons of 1905 and 1906. About July 1, 1909, the station was reestablished by the United States Reclamation Service. The gage is located at the bridge of the Thorp-Taneum Valley road about a mile west of Thorp and 1½ miles below the head gate, and is in sec. 11, T. 18 N., R. 17 E. Measurements are made in a short flume about one-half mile above the gage. Both gage and measuring section are below the head gate of the Ellison-Bruton canal, which diverts from the West Kittitas canal.

The conditions are not such as to give results of the highest accuracy.

Discharge measurements of West Kittitas canal near Thorp, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 13	H. Kimble	13.7	9.38	0.75	16.9
June 10	do	13.7	26	1.8	63.2
Aug. 5	do	13.7	38.1	2.6	103
20	do	13.7	42.5	2.85	118
Sept. 1	do	13.7	35	2.4	88.9
17	do	13.7	24.7	1.7	54

Daily gage height, in feet, and discharge, in second-feet, of West Kittitas canal near Thorp, Wash., for 1910.

[A. M. Lechman, observer.]

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.80	64	1.30	40	2.70	110	2.45	97	2.35	87	1.45	36
2	1.80	64	2.23	85	2.70	110	2.40	94	2.25	81	1.50	39
3	1.10	32	1.80	64	2.70	110	2.60	105	2.20	78	1.80	54
4	1.10	32	1.75	61	2.75	113	2.60	105	2.15	75	2.30	84
5	2.10	78	1.55	52	2.75	113	2.56	102	2.07	70	1.10	21
6	2.30	89	2.20	84	2.63	106	2.52	100	2.00	66	1.10	21
7	2.40	94	2.20	84	2.62	106	2.70	110	1.90	60	.....	.....
8	2.30	89	1.90	68	2.70	110	2.70	110	1.90	60	.....	.....
9	2.30	89	1.80	64	2.62	106	2.66	108	1.95	63	.....	.....
10	.....	17	1.78	62	2.62	106	2.70	110	1.90	60	.....	.....
11	.....	17	2.10	78	2.90	121	2.70	110	1.92	61	.....	.....
12	.....	17	2.55	102	2.60	105	2.74	112	1.90	60	.....	.....
13	.75	17	2.47	98	2.50	99	2.84	117	1.87	58	.....	.....
14	.....	17	2.10	78	2.52	100	2.84	117	1.90	60	.....	.....
15	.....	17	1.85	66	2.50	99	2.85	118	1.85	57	.....	.....
16	.....	17	1.70	59	2.53	100	2.90	121	1.82	55	.....	.....
17	.....	17	2.20	84	2.45	97	2.85	118	1.80	54	.....	.....
18	.....	17	1.70	59	2.44	93	2.84	117	1.65	46	.....	.....
19	.....	17	1.70	59	2.30	89	2.80	115	1.62	45	.....	.....
20	1.90	68	1.80	64	2.23	85	2.85	118	1.60	44	.....	.....
21	2.30	89	1.80	64	2.16	82	2.90	121	1.60	44	.....	.....
22	2.60	105	1.10	32	2.23	85	2.90	121	1.53	40	.....	.....
23	2.70	110	.....	0	2.50	99	3.00	126	1.55	42	.....	.....
24	2.90	121	.....	0	2.50	99	3.00	126	1.50	39	.....	.....
25	2.76	113	.....	0	2.50	99	2.65	105	1.50	39	.....	.....
26	2.70	110	.....	0	2.50	99	2.60	102	1.50	39	.....	.....
27	2.68	109	.....	0	2.50	99	2.55	99	1.45	36	.....	.....
28	2.52	100	.....	0	2.50	99	2.50	96	1.45	36	.....	.....
29	1.90	68	.52	9	2.46	97	2.50	96	1.42	35	.....	.....
30	1.80	64	.53	10	2.44	97	2.50	96	1.47	38	.....	.....
31	2.23	85	.....	.....	2.50	99	2.50	96	.....	.....	.....	.....

NOTE.—Daily discharge determined by means of two fairly well-defined rating curves, one applicable Apr. 1 to Aug. 20, and the other Aug. 21 to Oct. 6. The cause or exact time of the change is unknown, so that some uncertainty exists as to the accuracy of the determinations of discharge during August.

Monthly discharge of West Kittitas canal near Thorp, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May	121	17	62.7	3,860	B.
June	102	0	50.9	3,030	B.
July	121	82	101	6,210	B.
August	126	94	109	6,700	B.
September	87	35	54.3	3,230	B.
Oct. 1–6	84	21	42.5	506	B.
The season	126	0	74.7	23,500	

ELLENSBURG WATER CO.'S CANAL NEAR ELLENSBURG, WASH.

The Ellensburg Water Co.'s canal heads in the left bank of the Yakima River about 9 miles northwest of Ellensburg, in sec. 12, T. 18 N., R. 18 E. The area under irrigation in 1905 was determined as 10,000 acres, and has not since been extended.

The station was established in the spring of 1904 and discontinued in the fall of 1905, the gage being located at a cattle bridge one-fourth mile below the head gate. In June, 1909, the station was reestablished by the United States Reclamation Service and moved downstream to a short flume opposite the C. E. Stevens ranch house, below the controlling spill, and a mile below the head gate. In the spring of 1910 the datum was changed so that the zero of the gage would correspond to the bottom of the flume.

The results are accurate.

Discharge measurements of Ellensburg Water Co.'s canal near Ellensburg, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec. ft.*
May 13	H. Kimble	13.5	30.4	2.25	92.8
June 11	do	13.5	44.6	3.30	166
23	do	13.5	36.9	2.73	125
July 6	J. E. Forman	13.5	40.8	3.02	127
Aug. 2	do	13.5	43.2	3.20	158
5	H. Kimble	13.5	39.8	2.95	133

Daily gage height, in feet, and discharge, in second-feet, of Ellensburg Water Co.'s canal near Ellensburg, Wash., for 1910.

(C. E. Stevens, observer.)

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.05	30	3.25	162	2.8	131	3.2	159	2.8	131	1.65	58
2	1.0	28	3.4	173	2.7	124	3.15	156	.....	124	1.7	60
3	1.0	28	3.0	145	2.7	124	3.15	156	2.6	117	1.95	75
4	.95	26	2.9	138	2.65	120	3.0	145	2.6	117	2.65	120
5	1.6	58	2.75	128	2.6	117	3.0	145	2.45	106	.8	20
6	2.3	96	2.7	124	2.8	131	2.9	138	2.35	100	1.35	42
7	2.35	100	2.8	131	3.0	145	2.9	138	2.35	100	1.6	55
8	2.4	103	2.8	131	2.85	134	2.9	138	2.2	90	1.65	58
9	2.35	100	2.8	131	2.9	138	2.9	138	2.3	96	1.7	60
10	2.35	100	2.95	142	2.9	138	2.85	134	2.2	90	1.7	60
11	2.4	103	3.3	166	3.1	152	2.95	142	2.3	96	1.65	58
12	2.4	103	3.5	180	1.6	55	3.0	145	2.25	93	1.55	52
13	2.3	96	3.05	148	Dry.	0	2.95	142	2.2	90	1.6	55
14	2.2	90	3.05	148	2.15	87	2.95	142	2.15	87	1.2	36
15	2.6	117	3.1	152	2.0	78	2.95	142	2.2	90	1.2	36
16	2.55	114	3.1	152	2.05	81	2.8	131	2.1	84	.....	.....
17	2.8	131	2.95	142	2.3	96	2.75	128	2.0	78	.....	.....
18	3.0	145	2.65	120	2.35	100	2.75	128	1.85	69	.....	.....
19	3.1	152	2.5	110	2.25	93	2.75	128	1.75	63	.....	.....
20	3.05	148	2.5	110	2.1	84	2.8	131	1.65	58	.....	.....
21	3.0	145	2.5	110	2.65	120	2.8	131	1.65	58	.....	.....
22	3.0	145	2.7	124	3.0	145	2.8	131	1.6	55	.....	.....
23	3.1	152	2.8	131	3.0	145	2.8	131	1.6	55	.....	.....
24	3.25	162	2.55	114	3.1	152	2.85	134	1.55	52	.....	.....
25	3.3	166	2.85	134	3.0	145	2.65	120	1.55	52	.....	.....
26	3.25	162	2.9	138	2.9	138	2.75	128	1.5	50	.....	.....
27	3.1	152	3.0	145	2.9	138	2.75	128	1.5	50	.....	.....
28	3.05	148	2.95	142	2.65	120	2.65	120	1.45	48	.....	.....
29	3.0	145	2.9	138	2.85	134	2.65	120	1.45	48	.....	.....
30	2.95	142	3.0	145	3.1	152	2.65	120	1.45	48	.....	.....
31	3.1	152	.....	.....	3.15	156	2.5	110	.....	.....	.....	.....

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Ellensburg Water Co.'s canal near Ellensburg, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Apr. 30	.....	.....	32	63.5	A.
May	166	26	114	7,010	A.
June	180	110	138	8,210	A.
July	156	0	118	7,260	A.
August	159	110	135	8,300	A.
September	131	48	79.8	4,750	A.
Oct. 1-15	120	20	56.3	1,680	A.
The season	180	0	111	37,300	

SELAH-MOXEE CANAL AT POMONA, NEAR SELAH, WASH.

The Selah-Moxee canal heads in the left bank of the Yakima in sec. 8, T. 14 N., R. 19 E., just below Pomona Gap, the entrance to Yakima Canyon. It irrigates the eastern part of the Selah Valley, passes through Selah Gap, and irrigates the eastern part of the Moxee Valley. The area under water has not been determined since 1905, and the acreage has been considerably extended since that time.

The station was established in the spring of 1904 on a footbridge near Selah (now Pomona) Siding, about 1½ miles below the intake. It was suspended after the irrigating season of 1905. In 1909 the United States Reclamation Service reestablished the station, removing the gage to the flume back of Pomona depot and about 800 feet upstream from the old site. In the spring of 1910 the gage was returned to the old site, but the datum is probably different. The gage is below the first spill.

Weeds grow in the canal near this station, but their effect is eliminated from determinations of discharge by using the indirect method. Results are very accurate.

Discharge measurements of Selah-Moxee canal at Pomona, near Selah, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 16	H. Kimble	12.7	17	1.50	37.0
30	.....do	13.5	22.5	1.90	60.3
May 25	.....do	14	24.4	2.02	65.6
June 21	.....do	14	25.2	2.08	65.9
29	J. E. Forman	14	26.7	2.15	69.6
July 19	H. Kimble	15	29.5	2.35	74.9
Aug. 17	.....do	14.5	27.3	2.20	67.0
Sept. 3	H. D. McGlashan	14	24.2	2.01	58.6
13	.....do	13.5	24.1	2.00	58.8
Oct. 18	F. B. Storey	13	17.7	1.56	34.1

Daily gage height, in feet, of Selah-Moxee canal at Pomona, near Selah, Wash., for 1910.

[E. T. Stevens, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	1.98	2.10	2.05	2.22	2.12	1.91	16	1.50	1.95	2.05	2.31	2.27	2.02	1.60
2	.....	1.90	2.10	2.10	2.25	2.14	1.91	17	1.52	1.97	2.02	2.34	2.23	2.03	1.66
3	.....	1.98	2.04	2.26	2.22	2.09	1.70	18	1.54	1.98	2.00	2.38	2.22	2.01	1.56
4	0.80	2.00	2.00	2.26	2.21	2.12	1.80	19	1.56	1.98	2.08	2.33	2.22	2.02	1.56
5	.80	2.00	2.04	2.25	2.22	2.11	1.53	20	1.56	2.00	2.02	2.38	2.21	2.00	1.68
6	.90	1.98	2.10	2.20	2.29	2.11	1.58	21	1.48	1.95	2.02	2.33	2.22	1.92	1.59
7	.88	1.98	2.08	2.18	2.25	2.10	1.58	22	1.52	1.94	2.10	2.29	2.25	1.80	1.59
8	1.00	2.00	2.08	2.25	2.28	2.09	1.57	23	1.70	2.07	2.02	2.36	2.23	1.82	1.61
9	1.12	1.98	2.08	2.24	2.23	2.11	1.57	24	1.70	2.07	2.10	2.40	2.22	1.80	1.70
10	1.20	1.91	2.10	2.21	2.21	2.10	1.57	25	1.70	2.01	2.10	2.30	2.18	1.79	1.60
11	1.21	1.92	2.00	2.26	2.28	2.02	1.55	26	1.69	2.04	2.06	2.28	2.16	1.77	1.61
12	1.46	1.91	2.10	2.30	2.30	1.99	1.53	27	1.70	2.05	2.12	2.27	2.19	1.77	1.41
13	1.52	1.88	2.08	2.35	2.30	2.01	1.55	28	1.70	2.02	2.10	2.24	2.15	1.79	1.44
14	1.45	1.94	2.00	2.30	2.31	2.01	1.61	29	1.80	2.00	2.09	2.22	2.17	1.79	1.43
15	1.47	1.94	2.05	2.32	2.28	2.04	1.60	30	1.90	2.01	2.05	2.20	2.12	1.77	1.42
								31	.....	2.02	.....	2.22	2.12	.....	1.46

Daily discharge, in second-feet, of Selah-Moxee canal at Pomona, near Selah, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	63	70	61	67	64	53	16	37	61	65	74	71	60	36
2	.....	58	70	64	69	66	53	17	38	63	63	76	69	60	39
3	.....	63	66	74	67	63	42	18	39	63	62	78	69	59	34
4	13	64	64	74	67	65	47	19	40	63	67	74	69	60	34
5	13	64	66	72	68	64	34	20	40	64	63	77	69	58	40
6	15	63	69	69	72	65	36	21	36	61	63	74	69	54	36
7	15	63	68	68	70	64	36	22	38	61	67	71	71	47	36
8	18	64	68	72	72	64	35	23	47	69	62	76	70	48	37
9	22	63	68	70	69	65	35	24	47	69	67	78	69	47	41
10	25	59	69	69	67	64	35	25	47	65	66	72	67	47	36
11	25	59	63	72	72	60	34	26	47	67	63	71	66	46	37
12	35	59	69	74	73	58	34	27	47	67	67	70	68	46	28
13	38	57	67	77	73	60	34	28	47	66	66	69	66	47	29
14	35	61	63	73	74	59	37	29	53	64	64	67	67	47	29
15	36	61	65	74	72	61	36	30	58	65	62	66	64	46	28
								31	.....	66	.....	67	64	.....	30

NOTE.—Daily discharge determined by the indirect method for shifting channels to eliminate errors caused by presence of weeds; the changes have been fully covered by measurements and the correction curve is well defined.

Monthly discharge of Selah-Moxee canal at Pomona, near Selah, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 4-30	58	13	35.2	1,880	A.
May	69	57	63.1	3,880	A.
June	70	62	65.7	3,910	A.
July	78	61	71.7	4,410	A.
August	74	64	69.0	4,240	A.
September	66	46	57.1	3,400	A.
October	53	28	36.5	2,240	A.
The season	78	13	57.3	24,000	

MOXEE CO. CANAL NEAR NORTH YAKIMA, WASH.

The head gate of the Moxee Co. canal is on the left bank of the river just below Selah Gap. It supplies water for the Hubbard and Moxee

canals which are owned and operated by the Moxee Co. and irrigate a large part of the Moxee Valley.

The station on the Moxee Co. canal was established about July 1, 1909, about one-fourth mile below the head gate. At the same time the stations on the Moxee and Hubbard canals, which had been maintained during the irrigating reasons of 1904, 1905, and 1906, were reestablished.

The flow of the Moxee Co. canal does not equal the sum of the Hubbard and Moxee canals, as at times the Hubbard gets water from the Fowler canal intake and vice versa, while part of the water diverted by the Moxee Co. canal is wasted back to the river through an old slough. A record of the water diversion of the Moxee Co. is therefore obtained, not by the station on the Moxee Co. canal, but by the sum of the discharges at the stations on Moxee and Hubbard canals.

The stations on these canals are located on the Moxee hop ranch about one-fourth mile below the Hubbard intake. Weeds growing in the channels of both canals cause backwater and make it necessary to use indirect methods for determining the flow.

Discharge measurements of Moxee canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 7	H. Kimble	6.9	3.06	0.45	1.93
24	.....do	8.9	9.65	1.26	13.2
May 21	.....do	8.5	8.9	1.25	9.88
21	F. C. Ebert	8.5	8.9	1.25	9.79
June 20	H. Kimble	9.0	10.2	1.43	7.57
28	J. E. Forman	11.0	15.1	1.80	11.7
July 18	H. Kimble	11.5	16.2	2.01	8.62
Aug. 15	.....do	11.0	16.6	2.10	9.39
Sept. 12	.....do	8.0	6.6	1.00	1.38

Daily gage height, in feet, of Moxee canal near North Yakima, Wash., for 1910.

[Miss Grace Butterfield, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	1.4	1.4	0.95	1.9	1.5	0.8	16	0.3	1.25	0.9	2.1	2.1	1.1	0.7
2	.....	1.4	1.4	1.95	2.05	1.55	.8	17	.8	1.15	1.2	2.05	2.1	1.1	.75
3	.....	1.45	1.4	1.85	2.0	1.45	.55	18	.8	1.35	1.55	2.0	2.1	1.2	.65
4	.....	1.4	1.4	1.85	2.1	1.3	.85	19	.9	1.25	1.55	2.1	2.05	1.1	.7
5	.....	1.4	1.5	1.85	2.15	1.35	.....	20	1.0	1.35	1.55	2.2	2.05	.9	.65
6	.....	1.4	1.55	1.85	2.05	1.3	.....	21	1.0	1.35	1.4	2.15	2.1	1.0	.7
7	.....	1.4	1.4	2.05	2.15	1.0	.....	22	1.35	1.25	1.55	2.1	2.05	1.1	.7
8	.....	1.4	1.4	1.95	2.2	.95	.....	23	1.35	1.35	1.65	2.1	2.0	1.4	.55
9	0.1	1.55	1.3	2.1	2.1	1.05	.....	24	1.45	1.3	1.6	2.1	2.1	1.35	.4
10	.1	1.4	1.35	2.1	2.05	1.1	.....	25	1.3	1.2	1.75	2.0	1.8	1.3	.45
11	.1	1.4	.95	2.1	2.05	1.05	.7	26	1.3	.5	1.7	1.8	1.85	1.35	.5
12	.1	1.4	1.0	2.1	2.05	1.0	.75	27	1.4	.55	1.7	2.0	1.8	1.0	.6
13	.3	1.4	1.0	2.1	2.1	1.15	.75	28	1.3	1.4	1.7	2.25	1.75	.95	.65
14	.3	1.45	1.0	2.1	2.1	1.1	.5	29	1.35	1.4	1.8	2.05	1.75	1.0	.5
15	.3	1.25	1.0	2.15	2.1	1.05	.75	30	1.4	1.4	1.95	2.0	1.75	.8	.7
								31	.....	1.4	.....	1.85	1.7	.....	.6

Daily discharge, in second-feet, of Moxee canal near North Yakima, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	16	11	0.5	6.2	4.2	0.4	16	0.6	11	1.8	11	9.6	2.6	4.5
2	.....	15	10	13	8.5	5.2	.4	17	5.8	9.0	4.9	9.8	9.6	2.6	5.2
3	.....	16	10	11	7.6	4.2	.0	18	5.8	12	9.8	8.8	9.8	3.7	4.0
4	.....	15	10	11	9.3	2.7	.7	19	7.2	10	9.8	10	9.1	2.7	4.5
5	.....	15	12	10	9.9	3.5	.0	20	8.8	12	9.6	12	9.1	.9	4.0
6	.....	15	12	10	8.2	3.3	.0	21	10	12	6.9	11	10	1.8	4.5
7	.....	15	9.6	13	9.9	.8	4.5	22	15	9.9	9.1	9.9	9.4	2.7	4.5
8	.....	14	9.4	11	11	.5	4.5	23	15	11	10	9.9	9.0	6.4	2.8
9	0.0	17	7.6	13	9.3	1.5	4.5	24	16	10	9.4	9.8	11	5.7	1.4
10	.0	14	8.2	13	8.5	2.1	4.5	25	14	8.7	12	7.9	6.4	5.0	1.8
11	.0	14	3.0	13	8.5	1.8	4.5	26	14	.5	11	5.2	7.3	5.8	2.3
12	.0	14	3.4	12	8.5	1.4	5.2	27	16	.8	10	7.9	6.9	1.8	3.4
13	.6	14	3.2	12	9.3	3.0	5.2	28	14	11	10	12	6.5	1.4	4.0
14	.6	14	3.1	12	9.4	2.5	2.3	29	15	11	11	8.7	6.6	1.8	2.3
15	.6	11	3.0	12	9.4	2.1	5.2	30	16	11	14	7.8	6.9	0.3	3.5
								31	.....	11	.....	5.7	6.5	.....	3.4

NOTE.—Daily discharge determined by indirect method to eliminate effect of backwater caused by weeds in channel; correction curve fairly well defined.

Monthly discharge of Moxee canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 13-30	16	0.6	9.72	347	B.
May	17	.5	11.9	732	B.
June	14	1.8	8.49	505	B.
July	13	.5	10.1	621	B.
August	11	6.2	8.62	530	B.
September	6.4	.5	2.80	167	B.
October	5.2	.0	3.16	194	B.
The season	17	.0	7.74	3,100	

Discharge measurements of Hubbard canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 24	H. Kimble	12	11.5	0.45	20.3
May 21	do	12	15.2	.82	24.7
21	F. C. Ebert	12	15.6	.82	25.9
June 20	H. Kimble	12	14.7	.79	22.6
28	Z. E. Forman	12	18	1.02	28.4
July 18	H. P. Gilkey	12	15.6	.82	19.3
Aug. 15	H. Kimble	12	16.2	.9	19.8
Sept. 12	do	12	10.7	.54	8.9
Oct. 11	F. B. Storey	12	10.6	.51	4.7

Daily gage height, in feet, of Hubbard canal near North Yakima, Wash., for 1910.

[Miss Grace Butterfield, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	0.85	0.9	0.9	0.6	0.65	1.05	16	.....	0.55	0.8	1.0	0.9	0.85	0.45
2	.....	.85	.9	.9	.7	.65	1.05	17	.....	.85	.8	.9	.9	.85	.4
3	.....	.85	.9	.9	.65	.55	1.05	18	.....	.9	.8	.9	.9	.85	.4
4	.....	.9	.8	.9	.7	.5	1.0	19	.....	.85	.4	.8	.9	.85	.4
5	.....	.9	.8	.9	.7	.5	.....	20	.....	.95	.4	.95	.9	.8	.45
6	.....	.95	.8	.95	.6	.55	.....	21	.....	.8	.8	.9	.95	.9	.4
7	.....	1.0	.8	.95	.7	.4	.....	22	.....	.95	.8	.9	.9	.9	.45
8	.....	.8	.8	1.0	.7	.5	.....	23	.....	.95	.9	1.0	.9	.95	.25
9	.....	.8	.8	1.0	.8	.35	.....	24	0.2	.9	1.05	.9	.....	.95	.4
10	.....	.8	.8	1.0	Dry.	.6	.....	25	.9	.9	.9	.9	.9	1.05	.5
11	.....	.9	.8	1.0	Dry.	.6	.5	26	.8	1.0	1.0	.85	.85	1.1	.3
12	.....	.7	.95	1.0	.9	.55	.5	27	.8	.9	1.0	.7	.85	1.05	.55
13	.....	.....	.8	1.0	.95	.65	.45	28	.9	.9	1.0	.85	.8	1.0	.1
14	.....	.75	.7	.95	.95	.65	.45	29	.2	.9	1.0	.7	.8	.9	..3
15	.....	.5	.7	.95	.9	.65	.4	30	.5	.9	.95	.5	.8	1.0	.45
								31	.....	.9	.....	.55	.75	.....	.4

Daily discharge, in second-feet, of Hubbard canal near North Yakima, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	30	27	24	14	12	18	16	.....	20	23	24	20	15	3.3
2	.....	30	27	24	16	12	17	17	.....	28	23	21	20	15	2.4
3	.....	30	27	24	14	9.9	17	18	.....	28	23	21	19	15	2.4
4	.....	31	24	24	16	8.9	16	19	.....	27	14	19	19	15	2.4
5	.....	31	24	23	16	8.7	15	20	.....	30	13	22	19	13	3.3
6	.....	32	24	24	13	9.5	12	21	.....	26	23	21	20	15	2.4
7	.....	33	24	24	15	6.5	10	22	.....	29	23	21	19	15	3.3
8	.....	28	24	25	15	8.5	8.0	23	.....	29	25	24	19	16	3.3
9	.....	28	24	25	18	5.5	6.0	24	14	28	29	21	19	16	2.4
10	.....	28	24	25	0	10	5.0	25	32	28	25	21	19	18	4.2
11	.....	30	24	25	0	10	4.0	26	29	30	28	20	17	19	1.0
12	.....	24	27	24	20	9.1	4.2	27	29	28	28	16	17	18	5.2
13	.....	25	24	24	21	11	3.3	28	32	28	28	20	16	17	.0
14	.....	26	21	23	21	11	3.3	29	14	28	27	16	16	14	1.0
15	.....	19	21	23	20	11	2.4	30	22	27	25	11	16	16	3.3
								31	.....	27	.....	12	14	.....	2.4

NOTE.—Daily discharge determined by indirect method to eliminate effect of backwater caused by weeds in channel; correction curve fairly well defined.

Monthly discharge of Hubbard canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Apr. 24–30	32	14	24.6	342	B.
May	33	19	27.9	1,720	B.
June	29	13	24.1	1,430	B.
July	25	11	21.6	1,330	B.
August	20	0	16.4	1,010	B.
September	19	5.5	12.7	756	B.
October	18	0	5.92	364	B.
The season	33	0	18.3	6,950	

FOWLER CANAL NEAR NORTH YAKIMA, WASH.

The Fowler canal heads in the left bank of the Yakima in sec. 18, T. 13 N., R. 19 E., and irrigates a large part of the Moxee Valley. The canal has been extended by the Union Gap Irrigation Co. through Union Gap and is used to irrigate a considerable acreage of fruit land above the Sunnyside canal.

The station was established in May, 1904, the gage being located in a flume at the Moxee hop ranch, one-half mile below the head gate. The location and datum of the gage have not been changed. The station was discontinued after the season of 1906 but was reestablished by the United States Reclamation Service about July 1, 1909.

The relation of gage height to discharge is affected and the accuracy of the records is reduced during short periods by backwater caused by manipulation of lateral gates or by the accumulation of trash in the canal.

Discharge measurements of Fowler canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 7	H. Kimble	9.8	6.0	0.58	12.8
24	do	9.8	10.4	1.02	36.9
May 21	do	9.8	15.6	1.55	62.2
June 20	do	9.8	11.6	1.14	40.4
28	J. E. Forman	9.8	14.9	1.40	56.7
July 15	do	9.8	15.0	1.48	50.9
18	H. Kimble	9.8	11.1	1.10	39.4
Aug. 15	do	9.8	15.5	1.55	56.6
Sept. 12	do	9.8	10.9	1.08	39.2

Daily gage height, in feet, of Fowler canal near North Yakima, Wash., for 1910.

[Miss Grace Butterfield, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	0.3	0.9	1.65	1.4	1.25	1.15	0.55	16	0.8	1.2	1.2	1.5	1.5	1.0	0.1
2	.35	.95	1.65	1.45	1.35	1.15	.65	17	.8	1.3	1.2	1.45	1.5	.85	.1
3	.5	.9	1.4	1.45	1.3	1.1	.55	18	.8	1.5	1.15	1.1	1.45	.9	.1
4	.2	.9	1.4	1.3	1.35	.95	.5	19	1.0	1.55	1.1	1.05	1.4	.85	.1
5	.4	1.0	1.3	1.4	1.35	1.05	.4	20	1.0	1.55	1.2	1.35	1.4	.85	.1
6	.4	1.5	1.45	1.45	1.3	1.1	.7	21	.9	1.55	1.1	.9	1.25	.8	.4
7	.4	1.5	1.3	1.5	1.35	1.0	.65	22	.95	1.6	1.2	1.2	1.25	.85	.4
8	.3	1.5	1.4	1.35	1.4	1.05	.7	23	1.0	1.75	1.2	1.3	1.15	.85	.5
9	.5	1.1	1.3	1.35	1.4	.9	.7	24	1.0	1.75	1.3	1.3	1.3	.85	.6
10	.6	1.4	1.3	1.4	1.5	1.05	.7	25	1.05	1.75	1.3	1.3	1.25	.8	.55
11	.6	1.5	1.3	1.35	1.35	1.0	.1	26	1.2	1.7	1.4	1.4	1.2	.85	.4
12	.8	1.3	1.45	1.45	1.35	1.05	.1	27	1.25	1.7	1.55	.....	1.25	.75	.45
13	.7	1.3	1.45	1.35	1.4	1.05	.1	28	1.0	1.6	1.4	1.15	1.25	.85	.3
14	.7	1.2	1.45	1.5	1.4	1.05	.1	29	.95	1.6	1.4	1.15	1.25	.8	.35
15	.8	1.2	1.3	1.5	1.45	1.05	.1	30	.95	1.65	1.4	.95	1.25	.65	.4
								31	.....	1.5	.....	1.0	1.25	.....	.45

Daily discharge, in second-feet, of Fowler canal near North Yakima, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1....	5.0	28	70	55	47	41	12	16....	23	44	44	61	61	33	1.5
2....	6.2	30	70	58	52	41	16	17....	23	50	44	58	61	26	1.5
3....	10	28	55	58	50	38	12	18....	23	61	41	38	58	28	1.5
4....	3.0	28	55	50	52	30	10	19....	33	64	38	36	55	26	1.5
5....	14	33	50	55	52	36	7.5	20....	33	64	44	52	55	26	1.5
6....	14	61	58	58	50	38	18	21....	28	64	38	28	47	23	7.5
7....	14	61	50	61	52	33	16	22....	30	67	44	44	47	26	7.5
8....	5.0	61	55	52	55	36	18	23....	33	76	44	50	41	26	10
9....	10	38	50	52	55	28	18	24....	33	76	50	50	50	26	14
10....	14	55	50	55	61	36	18	25....	36	76	50	50	47	23	12
11....	14	61	50	52	52	33	1.5	26....	44	73	55	55	44	26	7.5
12....	23	50	58	58	52	36	1.5	27....	47	73	64	48	47	20	9.0
13....	18	50	58	52	55	36	1.5	28....	33	67	55	41	47	26	5.0
14....	18	44	58	61	55	36	1.5	29....	30	67	55	41	47	23	6.2
15....	23	44	50	61	58	36	1.5	30....	30	70	55	30	47	16	7.5
								31....	.....	61	.....	33	47	.....	9.0

NOTE.—Daily discharge determined from a fairly well-defined rating curve. A few of the measurements indicate backwater, which is probably caused by the accumulation of trash in the canal or the manipulation of lateral gates; accuracy of the mean not appreciably diminished during 1910.

Monthly discharge of Fowler canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	47	3.0	22.3	1,330	B.
May	76	28	55.6	3,420	B.
June	70	38	51.6	3,070	B.
July	61	30	51.0	3,140	B.
August	61	41	51.6	3,170	B.
September	41	16	30.3	1,800	B.
October	16	1.5	8.25	507	B.
The season	76	1.5	38.6	16,400	

NEW RESERVATION CANAL NEAR YAKIMA, WASH.

The New Reservation canal diverts water from the right bank of Yakima River 6 miles below North Yakima and just below Union Gap.

The gaging station was established May 9, 1904, at a highway bridge 1,000 feet below the head gate and above all diversions from the canal. The canal carries a small amount of water during the winter months for domestic uses.

At present the canal is owned and operated by the United States Indian Service. The Wapato project of the United States Reclamation Service, by which the lands on the Yakima Indian Reservation will be irrigated, involves as one of its features the enlargement and extension of the canal.

The conditions at the station are not favorable for good results. The current in the canal is low, and water grass grows profusely in the

bed and on the banks of the canal, creating backwater at the gage as the season advances. Several unsuccessful attempts have been made to get rid of this growth, as it interferes with the operation of the canal. The discharge must therefore be computed by the indirect method, which will give reasonably accurate results if a sufficient number of measurements are made.

Discharge measurements of New Reservation canal near Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 5	H. Kimble	38	43	1.00	41
27	do	38	142	3.62	333
May 6	H. D. McGlashan	39	147	3.76	331
24	Ebert and Kimble	38	157	4.00	351
31	W. P. Webber	.....	.....	3.92	360
June 3	H. Kimble	38	152	3.9	323
17	do	38	166	4.24	346
18	J. E. Forman	38	172	4.35	332
27	do	38	159	4.17	371
July 1	H. Kimble	38	103	2.6	92
8	Kimble and Storey	38	165	4.23	259
13	H. Kimble	38	185	4.71	390
25	J. E. Forman	38	175	4.54	275
27	H. Kimble	38	136	3.43	137
Aug. 12	F. B. Storey	38	129	3.28	92
24	H. Kimble	38	148	3.78	171
Sept. 6	do	38	138	3.50	134
Oct. 16	F. F. Henshaw	38	124	3.08	167

Daily gage height, in feet, of New Reservation canal near Yakima, Wash., for 1910.

[F. H. Hall, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	1.10	3.90	3.90	4.33	3.00	3.40	2.90	17	3.40	4.00	4.20	4.50	3.70	3.00	3.20
2	1.10	3.90	3.90	4.33	3.02	3.40	2.90	18	3.40	3.90	4.30	4.46	3.70	2.90	3.20
3	1.20	3.80	3.90	4.42	3.05	3.40	2.90	19	3.40	3.90	4.20	4.46	3.70	2.90	3.20
4	1.20	3.80	3.90	4.42	3.00	3.50	3.00	20	3.40	3.90	4.20	4.46	3.50	2.90	3.20
5	1.80	3.80	3.80	4.50	2.90	3.52	3.10	21	3.60	3.90	4.20	4.35	3.50	3.00	3.20
6	2.90	3.90	3.70	4.66	2.90	3.50	3.20	22	3.60	3.80	4.20	4.35	3.50	3.00	3.20
7	2.90	3.90	3.60	3.00	2.90	3.50	3.20	23	3.60	4.00	4.20	4.35	3.50	2.80	3.00
8	2.90	3.90	3.50	4.66	3.25	3.00	3.10	24	3.80	4.00	4.20	4.35	3.78	2.80	3.00
9	2.90	3.90	3.50	4.66	3.44	3.00	3.00	25	3.80	4.00	4.20	4.35	3.60	2.80	3.00
10	2.80	3.90	3.60	4.46	3.44	3.00	3.00	26	3.80	4.00	4.20	4.33	3.60	2.80	3.00
11	2.80	3.80	3.70	4.66	3.30	3.00	3.00	27	3.70	4.00	4.20	3.33	3.70	2.80	2.90
12	3.00	3.80	4.00	4.66	3.50	3.00	3.00	28	3.70	3.90	4.20	3.25	3.50	2.70	2.90
13	3.00	3.80	4.10	4.66	4.33	3.00	3.10	29	3.70	3.90	4.20	3.01	3.50	2.70	2.70
14	3.00	3.90	4.10	4.66	4.50	3.00	3.10	30	3.80	3.90	2.60	3.00	3.40	2.80	2.70
15	3.10	3.80	4.20	4.58	4.42	3.00	3.10	31	.....	3.90	.....	3.00	3.40	.....	2.40
16	3.10	3.80	4.20	4.50	4.42	3.00	3.10								

Daily discharge, in second-feet, of New Reservation canal near Yakima, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1....	49	360	324	287	79	125	121	16....	261	339	339	344	218	101	169
2....	49	360	322	285	79	123	121	17....	297	363	338	335	138	104	181
3....	58	347	321	293	80	123	123	18....	297	348	313	321	140	97	184
4....	58	347	320	292	73	134	136	19....	297	347	309	313	144	98	185
5....	113	347	307	299	63	136	148	20....	297	344	305	304	124	100	187
6....	237	360	293	317	62	134	162	21....	321	343	302	284	127	112	188
7....	237	360	279	122	61	136	164	22....	321	328	297	277	131	114	190
8....	237	360	266	350	91	88	155	23....	321	352	295	269	133	97	169
9....	237	360	265	387	109	90	146	24....	347	350	290	262	167	98	171
10....	225	360	275	361	108	91	147	25....	347	350	287	255	150	99	172
11....	225	347	285	387	94	92	148	26....	347	347	285	245	150	101	174
12....	249	347	320	387	113	94	150	27....	334	346	281	125	162	102	164
13....	249	346	331	387	205	97	164	28....	334	331	279	114	138	95	165
14....	249	356	330	382	226	98	165	29....	334	329	277	88	137	97	145
15....	261	342	340	365	217	99	167	30....	347	328	95	84	126	107	147
								31....	.....	325	.....	81	125	.....	116

NOTE.—Daily discharge after May 12 determined by indirect method on account of the growth of weeds in the canal; correction curve fairly well defined.

Monthly discharge of New Reservation canal near Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	347	49	251	14,900	B.
May	363	325	347	21,300	B.
June	340	95	296	17,600	B.
July	387	81	277	17,000	B.
August	226	61	128	7,870	B.
September	136	88	103	6,130	B.
October	190	116	159	9,780	B.
The season	387	49	223	94,600	

OLD RESERVATION CANAL NEAR WAPATO, WASH.

This canal was constructed and is operated by the United States Indian Service for the benefit of Indian lands on the Yakima Reservation.

A station was first established June 7, 1904, at the Northern Pacific Railway bridge about 1 mile below the head gate. A slough that carries considerable water is taken into this canal at a point 280 feet below the head gate. The water is carried to a point about 1,000 feet farther down the canal and there returned to the slough, which continues parallel to the river and forms both a wasteway for the canal and a channel from which diversions are made for irrigation.

On June 23, 1908, a new station was established 300 feet below the head gate of the canal and below the point where the waters from the slough are received, and just above the first diversion. The records at this point are not comparable with those formerly obtained at the railroad bridge, but they represent the amount of water taken from Yakima River.

Discharge measurements of Old Reservation canal near Wapato, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 5	H. Kimble	16.6	29.5	0.8	49
27	do	21	95	4.22	285
May 7	F. C. Ebert	20	95.2	3.92	255
7	H. Kimble	20	92	3.92	259
24	F. C. Ebert	19	90	3.68	240
July 1	H. Kimble	18.5	77.5	3.00	200
7	J. E. Forman	19	76.6	2.91	182
27	H. Kimble	17.5	59.5	2.02	127
Aug. 12	R. H. Bolster	17	41.7	1.10	65
Oct. 16	F. F. Henshaw	17	52.6	1.57	90

Daily gage height, in feet, of Old Reservation canal near Wapato, Wash., for 1910.

[W. A. Noblet, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	3.85	3.45	3.00	1.50	1.45	0.80	16	2.60	3.90	3.50	.....	.....	0.80	1.57
2	.....	.....	.....	.....	1.20	1.40	.90	17	3.25	.....	.....	.....	1.90	.....	1.70
3	.....	3.70	3.20	2.75	1.20	1.40	.....	18	3.40	3.80	.....	.....	1.40	.80	1.70
4	.....	3.75	.....	.....	1.20	.....	1.45	19	3.40	.....	3.22	2.30	1.40	.....	.....
5	0.80	.....	.....	2.77	1.00	1.30	.....	20	.....	3.85	.....	2.30	.....	.80	1.65
6	.....	3.85	.....	2.70	.....	.....	1.65	21	3.60	.....	.....	.....	1.40	.80	1.65
7	.....	3.95	3.10	2.84	.....	1.30	.....	22	.....	3.80	3.11	2.05	.....	.....	.....
8	.....	3.85	3.10	2.96	1.00	1.30	.....	23	3.80	.....	3.11	2.05	1.40	.82	.....
9	.....	3.80	3.10	.....	.....	.....	1.80	24	4.00	3.85	.....	.....	.....	.....	1.65
10	0.80	.....	.....	.....	1.00	1.30	.....	25	.....	.....	.....	.....	1.40	.82	.....
11	.....	3.80	3.54	.....	.....	.....	1.80	26	4.30	.....	.....	2.05	1.40	.82	1.75
12	2.40	3.70	.....	.....	1.05	.....	.....	27	4.22	3.85	3.30	2.02	.....	.....	1.75
13	.....	3.70	3.79	.....	.....	.....	1.80	28	3.85	.....	.....	1.80	.....	.80	.....
14	2.60	3.85	.....	.....	1.80	1.15	.....	29	.....	.....	.....	1.60	.....	.....	1.65
15	.....	.....	3.51	.....	1.85	.80	1.65	30	4.05	3.60	.....	.....	1.45	.80	.....
								31	.....	.....	.....	.....	.....	.....	1.65

Daily discharge, in second-feet, of Old Reservation canal near Wapato, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	49	251	224	192	90	87	49	16	164	255	227	155	114	49	94
2	49	246	215	183	72	84	54	17	210	252	220	151	115	49	102
3	49	241	206	174	72	84	70	18	220	248	210	147	84	49	102
4	49	244	203	175	72	81	87	19	220	250	207	143	84	49	100
5	49	248	202	176	60	78	93	20	227	251	204	143	84	49	99
6	49	251	200	171	60	78	99	21	234	250	202	134	84	49	99
7	49	259	199	181	60	78	102	22	241	248	200	126	84	50	99
8	49	251	199	189	60	78	105	23	248	250	200	126	84	50	99
9	49	248	199	184	60	78	108	24	263	251	203	126	84	50	99
10	49	248	215	180	60	78	108	25	275	251	206	126	84	50	102
11	100	248	230	176	62	75	108	26	287	251	210	126	84	50	105
12	150	241	238	172	63	73	108	27	281	251	213	123	85	50	105
13	157	241	247	168	85	71	108	28	251	245	208	108	85	49	102
14	164	251	238	164	108	69	104	29	259	240	203	96	86	49	99
15	164	253	228	159	112	49	99	30	267	234	198	94	87	49	99
								31	.....	229	.....	92	87	.....	99

NOTE.—Daily discharge determined from a well-defined rating curve; discharge interpolated for days on which gage was not read; accuracy of monthly means reduced by the gaps in the record.

Monthly discharge of Old Reservation canal near Wapato, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	287	49	162	9,640	B.
May	259	229	248	15,200	B.
June	247	198	212	12,600	B.
July	192	92	150	9,220	B.
August	115	66	81.0	4,980	B.
September	87	49	62.7	3,730	B.
October	108	49	97.0	5,960	B.
The season	287	49	145	61,300	

SUNNYSIDE CANAL NEAR WAPATO, WASH.[1]

The Sunnyside canal diverts water from the left bank of Yakima River in sec. 28, T. 12 N., R. 19 E., Willamette meridian. The canal system was purchased from the Washington Irrigation Co. by the United States Reclamation Service in July, 1906. Active operation by the Government began in 1907.

The canal is now 60 miles long and parallels Yakima River in its general direction. It irrigates practically all the land between the canal and the river, and has one lateral—Mabton siphon—which crosses the river to lands on the south side. The area under irrigation in 1910 is given as 50,672 acres. The operation of this system requires that hydrographic work of an exceptional degree of accuracy be carried on. During the irrigating season the general scheme of operation is effected by dividing the canal and the main lateral into beats, ranging in length from 3 to 8 miles, each in charge of a patrolman. Gaging stations, where the daily flow is measured, are maintained at the extremities of the beats. The amount diverted from the main canal is also measured by means of weirs or special measuring boxes. A complete discussion of the very interesting data that have been obtained on this canal system is too lengthy for discussion in this report, and only the quantity of water diverted from Yakima River as measured at the intake is presented in detail.

The gaging station, which is located 1,000 feet below the intake and above all deliveries, was established April 22, 1904, although records of flow of the canal have been kept ever since it has been in operation.

A new inclined gage was installed April 6, 1907, but the published gage heights for 1907 refer to the old vertical staff gage used in 1906.

[1] Description abstracted in part from Stevens, J. C., Hydrography as an aid in the successful operation of an irrigation system: Proc. Am. Soc. Civil Eng., vol. 36, No. 9, November, 1910, p. 1320; also discussion in vol. 36, No. 10, December, 1910, p. 1737. Mr. Stevens's paper contains a detailed account of this canal, together with data as to the amount of water used at various points, and gains and losses from seepage.

On July 31, 1907, a bridge from which measurements could be made was erected 600 feet below the intake of the canal. In the spring of 1908 a new inclined staff gage was set just above this bridge at a different datum. Gage heights for 1908 and 1909 are referred to this gage. Gage heights from April 20 to October 2, 1909, and for 1910 were taken by a Lietz self-registering gage set at the same datum as the staff gage at the bridge.

The results for 1910 have been furnished by the operating department of the Sunnyside project of the United States Reclamation Service, which has carried on the hydrometric work on the canal during the year.

Discharge measurements of Sunnyside canal near Wapato, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height (canal).	River hook gage.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*		*Sec.-ft.*
Mar. 30	J. S. Moore	40.0	86.7	2.01	.....	254
Apr. 12	E. C. Kinnear	43.0	137	3.25	.....	566
21	Moore and Kinnear	43.7	142	3.28	.....	574
29	E. C. Kinnear	44.8	157	3.64	.....	732
May 12	J. S. Moore	44.3	152	3.52	.....	685
18	E.C. Kinnear	44.7	154	3.56	.....	715
June 8	Moore and Humphrey	43.9	149	3.44	2.12	701
17	H. W. Humphrey	43.9	149	3.45	1.80	699
28	.....do	44.1	156	3.63	1.03	719
July 12	J. S. Moore	44.3	155	3.66	.66	724
19	Moore and Humphrey	44.3	159	3.68	.19	713
20	Humphrey and Moore	44.2	159	3.68	.11	716
21	Moore and Humphrey	44.3	158	3.69	.19	718
28	Humphrey and Stover	44.3	155	3.62	.10	711
Aug. 11	Stover and Moore	44.4	159	3.71	— .06	715
19	H. W. Humphrey	44.2	157	3.64	— .08	725
31	Moore and Stover	44.2	153	3.58	— .32	701
Sept. 7	C. S. Stover	43.6	141	3.30	— .62	626
19	J. S. Moore	43.7	143	3.32	— .35	640
30	Moore and Stover	43.7	145	3.36	— .57	650
Oct. 6	Stover and Moore	43.7	145	3.33	1.11	646
15	Moore and Stover	43.7	144	3.33	.94	644
16	F. F. Henshaw	44	147	3.24	.....	626
19	C. S. Stover	43.7	141	3.26	.77	627
29	.....do	43.5	138	3.20	.98	594
31	J. S. Moore	43.5	138	3.19	.96	592
31	.....do	43.1	127	2.93	1.02	529
Nov. 8	F. M. Schader	35.2	64.6	1.41	1.48	163
8	J. S. Moore	35.2	64.6	1.41	1.48	163
21	.....do	.....	45.0	.82	2.62	74.6

Daily gage height, in feet, of Sunnyside canal near Wapato, Wash., for 1910.

[W. R. Newland, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.30	3.55	3.48	3.66	3.63	3.49	3.32	2.72
2	.....	2.90	3.55	3.45	3.67	3.66	3.57	3.34	2.00
3	.....	2.90	3.55	3.45	3.66	3.68	3.54	3.34	1.50
4	.....	3.00	.....	3.46	3.67	3.70	3.40	3.34	1.50
5	.....	3.20	.....	3.45	3.66	3.71	3.25	3.34	1.50
6	.....	3.20	2.50	3.45	3.66	3.71	3.22	3.33	1.50
7	.....	3.20	2.70	3.45	3.70	3.70	3.28	3.33	1.50
8	.....	3.20	3.20	3.44	3.71	3.70	3.15	3.32	1.50
9	.....	3.20	3.55	3.44	3.67	3.71	3.11	3.35	1.50
10	.....	3.20	3.55	3.45	3.67	3.69	3.20	3.35	1.50
11	.....	3.20	3.56	3.48	3.66	3.69	3.18	3.33	1.50
12	.....	3.30	3.51	3.48	3.67	3.71	3.25	3.35	1.50
13	.....	3.30	3.51	3.48	3.67	.....	3.32	3.34	1.50
14	.....	3.30	3.55	3.48	3.68	.....	3.30	3.32	1.50
15	.....	3.30	3.54	3.48	3.69	1.80	3.31	3.29	1.50
16	.....	3.30	3.55	3.48	3.68	3.00	3.35	3.25	1.50
17	.....	3.30	3.55	3.48	3.67	3.40	3.35	3.25	.....
18	.....	3.30	3.56	3.48	3.68	3.68	3.35	3.25	.....
19	.....	3.30	3.55	3.48	3.68	3.66	3.33	3.25	.....
20	.....	3.30	3.49	3.48	3.69	3.66	3.31	3.25	.....
21	.....	3.15	3.50	3.48	3.68	3.61	3.38	3.25	.82
22	.....	3.40	3.52	3.48	3.67	3.60	3.34	3.25	.....
23	.....	3.40	3.51	3.48	3.67	3.62	3.34	3.25	.....
24	.....	3.50	3.51	3.48	3.68	3.63	3.34	3.28	.....
25	1.20	3.60	3.50	3.51	3.68	3.59	3.34	3.27	.....
26	1.20	3.55	3.47	3.51	3.67	3.58	3.33	3.25	.....
27	.....	3.55	3.47	3.57	3.69	3.58	3.33	3.20	.....
28	.....	3.60	3.48	3.63	3.63	3.60	3.34	3.20	.....
29	.....	3.60	3.48	3.63	3.58	3.59	3.00	3.20	.....
30	2.01	3.60	3.48	3.66	3.58	3.59	3.32	3.19	.....
31	.....	.....	3.48	.....	3.61	3.56	.....	3.19	.....

NOTE.—Canal dry May 4–5 and Aug. 13–14.

Daily discharge, in second-feet, of Sunnyside canal near Wapato, Wash., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	319	696	709	731	705	671	635	459	0
2	.....	447	696	696	735	713	709	643	282	0
5	.....	447	696	696	731	722	701	647	178	10
4	.....	481	0	701	731	722	651	651	178	40
5	.....	552	0	696	727	722	600	651	178	0
6	.....	552	402	701	727	722	593	647	178	0
7	.....	552	454	701	744	713	615	647	178	0
8	.....	548	559	696	749	713	570	643	178	0
9	.....	548	696	696	731	713	559	655	178	0
10	.....	548	696	701	731	705	593	651	178	0
11	.....	548	701	713	727	705	585	643	178	0
12	.....	585	680	713	731	718	612	651	178	0
13	.....	585	680	713	727	0	639	647	178	20
14	.....	585	701	713	731	0	635	639	178	40
15	.....	585	696	713	731	238	639	627	178	0
16	.....	585	705	713	722	467	655	612	178	0
17	.....	585	709	713	713	616	655	616	157	0
18	.....	585	718	709	718	735	655	623	137	0
19	.....	582	718	709	713	731	647	623	117	0
20	.....	582	692	705	718	731	639	620	97	0
21	.....	582	696	692	718	709	667	620	76	0
22	.....	620	709	684	713	709	651	620	10	0
23	.....	623	709	675	718	718	651	620	10	0
24	0	663	709	675	722	722	647	631	10	0
25	106	705	705	680	727	705	647	627	10	80
26	106	688	696	680	727	701	643	616	10	80
27	143	688	696	696	740	705	643	597	10	80
28	180	713	705	718	713	713	647	597	20	80
29	216	713	705	718	692	709	516	597	70	80
30	253	713	705	731	688	709	635	589	0	80
31	286	.....	705	.....	701	701	.....	589	.....	80

Monthly discharge of Sunnyside canal near Wapato, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet.)	Accuracy.
	Maximum.	Minimum.	Mean.		
March 25–31	286	106	184	2,550	B.
April	713	319	584	34,800	A.
May	718	0	633	38,900	A.
June	731	675	702	41,800	A.
July	749	688	719	44,200	A.
August	735	0	642	39,500	A.
September	709	516	632	37,600	A.
October	655	589	628	38,600	A.
November	459	0	132	7,860	B.
December	80	0	21.6	1,330	C.
The season	749	0	513	287,000	

NOTE.—Canal was practically dry Jan. 1 to Mar. 24.

SPILLWAYS FROM SUNNYSIDE CANAL.

During the irrigating season the Sunnyside canal is run practically full as far as Zillah, where the first wasteway is located, in order that the water level may be high enough to enter all the laterals. Here most of the water that is not needed below is spilled back into the river.

There are no other wasteways except at the lower end of the main canal near the 60-mile station in the NE. ¼ sec. 20, T. 9 N., R. 25 E.; on Rockyford lateral in sec. 34, T. 9 N., R. 23 E.; and on Mabton siphon in the NW. ¼ sec. 1, T. 8 N., R. 23 E.

The daily discharge of all these spillways is recorded because of their bearing on the quantity of water used for irrigation and on studies of seepage and return water on lower Yakima River.

Daily discharge, in second-feet, of Zillah wasteway near Zillah, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	10	10	0	0	14	134	16	82	0	30	0	0	110	152
2	.....	9	6	0	0	57	132	17	82	0	21	0	0	114	152
3	.....	8	2	3	0	66	134	18	86	0	17	0	0	106	168
4	.....	0	8	8	0	44	132	19	51	8	14	0	0	116	168
5	.....	0	3	0	0	15	139	20	23	0	0	0	0	102	197
6	.....	0	14	0	0	19	145	21	19	11	13	0	0	100	192
7	131	0	9	0	0	4	143	22	25	8	11	9	0	127	178
8	110	0	14	0	0	26	145	23	0	11	18	8	0	118	185
9	100	0	26	0	0	26	147	24	0	16	8	17	0	120	207
10	110	22	17	0	0	47	139	25	19	17	0	24	0	120	209
11	100	11	26	0	0	52	128	26	13	15	0	28	0	118	207
12	91	24	33	0	0	55	130	27	6	11	0	22	0	118	266
13	91	11	44	0	0	68	126	28	8	11	0	24	20	120	266
14	88	0	44	0	0	97	121	29	0	6	0	0	23	100	245
15	82	0	37	0	0	99	126	30	23	13	0	0	33	69	220
								31	.....	14	.....	0	43	.....	214

Daily discharge, in second-feet, of blow-off valve in Mabton siphon, near Mabton, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	0.0	.....	.....	.....	.....	0.0	21.7	16	14.0	.....	.....	.....	.....	17.4	55.0
2	45	.....	.....	.....	.....	.0	23.8	17	1.3	.....	.....	.....	.....	20.6	42.9
3	54.9	.....	.....	.....	.....	.0	22.7	18	6.6	.....	.....	.....	.....	20.5	47.1
4	45.0	.....	.....	.....	.....	.0	23.5	19	.0	.....	.....	.....	.....	22.3	43.3
5	25.6	.....	.....	.....	.....	.0	22.9	20	.0	.....	.....	.....	.....	20.9	45.0
6	45.0	.....	.....	.....	.....	.0	30.2	21	.0	.....	.....	.....	.....	20.7	43.1
7	60.9	.....	.....	.....	.....	.0	31	22	.0	.....	.....	.....	.....	19.6	47.4
8	52.4	.....	.....	.....	.....	.0	30.7	23	.0	.....	.....	.....	.....	22.0	50.5
9	57.5	.....	.....	.....	.....	.0	30.5	24	.0	.....	.....	.....	.....	21.6	49.2
10	45.0	.....	.....	.....	.....	.0	28.4	25	.0	.....	.....	.....	.....	21.3	56.5
11	45.0	.....	.....	.....	.....	14.9	32.1	26	.0	.....	.....	.....	.....	21.5	60.8
12	42.0	.....	.....	.....	.....	11.7	40.5	27	.0	.....	.....	.....	.....	21.8	39.3
13	60.8	.....	.....	.....	.....	26.6	57.3	28	.0	.....	.....	.....	.....	21.7	25.5
14	18.3	.....	.....	.....	.....	19.9	53.6	29	.0	.....	.....	.....	.....	21.5	38.0
15	28.1	.....	.....	.....	.....	25.2	57.4	30	.0	.....	.....	.....	.....	21.5	39.5
								31	.....	.....	.....	.....	.....	.....	37.5

Daily discharge, in second-feet, of Rockyford wasteway near Mabton, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	0.0	16.9	.....	.....	0.0	11.0	11.0	16	28.8	0.0	.....	.....	0.0	8.1	12.0
2	.0	16.9	.....	.....	.0	5.4	11.0	17	30.8	.0	.....	.....	.0	7.1	10.0
3	.0	16.9	.....	.....	.0	3.9	12.0	18	28.8	.0	.....	.....	.0	8.1	10.0
4	.0	16.9	.....	.....	.0	3.9	14.8	19	26.9	.0	.....	.....	.0	8.1	10.0
5	18.6	.0	.....	.....	.0	3.9	14.8	20	33.3	.0	.....	.....	.0	9.0	10.0
6	18.6	.0	.....	.....	.0	4.6	12.6	21	31.5	.0	.....	.....	.0	9.0	9.0
7	22.2	.0	.....	.....	.0	4.6	12.0	22	16.6	.0	.....	.....	.0	9.0	10.0
8	22.6	.0	.....	.....	.0	7.1	11.5	23	18.0	.0	.....	.....	.0	9.0	10.0
9	26.5	.0	.....	.....	.0	10.0	11.0	24	19.7	.0	.....	.....	.0	3.9	10.0
10	22.4	.0	.....	.....	.0	13.1	11.0	25	19.9	.0	.....	.....	5.4	3.9	9.0
11	23.3	.0	.....	.....	.0	13.1	11.0	26	20.5	.0	.....	.....	5.4	8.1	9.0
12	22.2	.0	.....	.....	.0	13.1	16.5	27	20.6	.0	.....	.....	11.0	8.1	9.0
13	24.3	.0	.....	.....	.0	12.0	15.4	28	20.8	.0	.....	.....	7.1	8.1	9.0
14	26.3	.0	.....	.....	.0	15.4	15.4	29	20.6	.0	.....	.....	7.1	12.6	10.0
15	26.7	.0	.....	.....	.0	13.6	13.1	30	21.6	.0	.....	.....	11.0	11.0	9.0
								31	.....	.0	.....	.....	11.0	.....	9.0

Daily discharge, in second-feet, of Sunnyside canal wasteway at 60-mile station, near Prosser, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	34.5	24	15.1	9.9	30.3	30.3	16	34.5	22	21	10.7	0.0	26.4	22.0
2	.....	34.5	27.7	14.2	9.1	24	25.2	17	42	22	22	9.1	9.1	27.7	22.0
3	.....	31	30.3	11.5	7.6	22	27.7	18	42	22.7	21	9.1	14.2	27.7	25.2
4	.....	.0	27.7	13.3	6.9	22	30.3	19	33	20	20	8.3	18	26.4	24.0
5	38	.0	27.7	12.4	5.6	23	29.0	20	31	22	25.2	10.7	15.1	24.0	25.2
6	38	.0	29	13.3	9.9	24	26.4	21	26	21	21	20	18	25.2	25.2
7	38	.0	30.3	17	15.1	26.4	24.0	22	24	23	20	18	18	26.4	25.2
8	29.5	47	29	18	8.3	30.3	25.2	23	25	21	19	19	17	24.0	26.4
9	40	30.3	29	17	8.3	29	27.7	24	29.5	19	16	19	21	25.2	26.4
10	34.5	27.7	29	21	8.3	29	30.3	25	33	18	20	17	20	26.4	32.9
11	31	23	30.3	22	8.3	27.7	29.0	26	38	18	12.4	15.1	21	29.0	30.3
12	31	26.4	27.7	18	10.7	21	32.9	27	36	18	14.2	15.1	24	30.3	31.6
13	24	22	26.4	16	7.6	30.3	29.0	28	31	16	12.4	15.1	22	29.0	24.0
14	40	19	26.4	11.5	.0	22	26.4	29	31	15.1	14.2	15.1	23	26.4	24.0
15	40	26.4	22	10.7	.0	26.4	25.2	30	33	17	12.4	15.1	24	26.4	17.0
								31	.....	18	.....	11.5	25.2	.....	21.0

Monthly discharge of Zillah wasteway at Zillah, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	131	0	55.8	3,320
May	24	0	7.6	467
June	44	0	14.2	845
July	28	0	4.6	283
August	43	0	3.8	234
September	127	4	78.2	4,650
October	266	121	169	10,400
The period				20,200

Monthly discharge of Mabton siphon blow-off valve near Mabton, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	60.9	0.0	21.6	1,290
September	26.6	.0	13.8	821
October	60.8	21.7	39.6	2,430
The period				4,540

Monthly discharge of Rockyford wasteway near Mabton, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	33.3	0.0	20.4	1,210
May	16.9	.0	2.2	135
August	11.0	.0	1.9	117
September	15.4	3.9	8.6	512
October	16.5	9.0	11.2	689
The period				2,660

Monthly discharge of Sunnyside canal wasteway at 60-mile station, near Prosser, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	42	0.0	29.1	1,730
May	47	.0	20.5	1,260
June	30.3	12.4	22.9	1,360
July	22	8.3	14.8	910
August	25.2	.0	13.1	806
September	30.3	21	26.3	1,560
October	32.9	17	26.5	1,630
The period				9,260

KIONA CANAL NEAR KIONA, WASH.

The Kiona canal diverts water from the left bank of Yakima River 5 miles upstream from Kiona, in sec. 10, T. 9 N., R. 20 E. It is

operated by the Northern Pacific Irrigation Co. The first systematic measurements were made in 1904, the station being established June 6, The records were interrupted during 1906–7, but were begun again on May 7, 1908.

The principal value of the records is in making a study of the discharge of Yakima River at Prosser. A station was established at Prosser May 30, 1904, but on account of the impossibility of measuring the discharge at low water the station was abandoned on December 12, 1906. The flow is under the artificial control of the power plant and mills located here. The station on Kiona canal was therefore established with the intention of accounting for the inflow and diversions between Prosser and Kiona, since at the latter point reliable discharge records of long standing are available.

The gage was originally established about 400 feet below the headgate, and the data for 1909 represents the amount diverted from the river. In 1910 the gage was removed 3 miles below the headgate to a point below all controlling spills, and the records for 1910 show the water actually used for irrigation.

The growth of weeds in the canal causes back water at the gage and and makes necessary the use of indirect methods of determining discharge after July 1.

Discharge measurements of Kiona canal near Kiona, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 2	H. Kimble	5.7	2.0	.45	5.3
May 10	do	5.7	8.0	1.50	21.0
June 7	do	5.7	10.9	1.92	27.7
Aug. 1	do	5.7	12.0	2.14	24.2
Sept. 5	F. B. Storey	5.7	12.0	2.08	23.8
15	do	5.7	11.3	1.99	21.1

Daily gage height, in feet, of Kiona canal near Kiona, Wash., for 1910.

[F. W. Rolph, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	0.85	1.2	1.7	2.1	2.1	2.0	1.7	16	0.85	1.8	1.9	2.15	2.5	1.9	1.5
2	.45	1.25	1.75	2.1	2.15	2.0	1.65	17	.85	1.9	1.8	2.15	2.5	1.9	1.5
3	.45	1.4	1.85	2.05	2.3	2.0	1.7	18	.85	1.85	1.7	2.1	2.5	1.9	1.45
4	.45	1.5	1.95	2.0	2.3	2.0	1.65	19	.95	1.9	1.6	2.0	2.5	1.9	1.45
5	.45	1.6	1.95	2.0	2.3	2.05	1.6	20	.95	1.9	1.4	1.95	2.6	1.9	1.45
6	.45	1.6	1.95	2.0	2.3	1.95	1.6	21	1.05	Dry.	1.5	1.95	2.6	1.9	1.45
7	.45	Dry.	1.95	2.05	2.3	2.0	1.6	22	1.1	1.5	1.6	1.85	2.5	1.85	1.35
8	.55	.9	1.95	2.1	2.3	2.0	1.65	23	1.1	1.9	1.7	1.4	2.1	1.85	1.25
9	.55	1.4	1.95	1.85	Dry.	2.0	1.6	24	1.1	1.9	1.85	1.35	2.15	1.9	1.25
10	.55	1.5	2.0	1.85	2.3	2.0	1.5	25	1.1	1.9	1.8	1.65	2.0	1.75	1.3
11	.65	1.5	2.05	2.05	2.4	2.0	1.5	26	1.15	1.9	1.7	1.65	2.0	1.85	1.2
12	.65	1.65	2.05	2.05	2.4	2.0	1.5	27	1.25	1.8	1.6	1.65	2.1	1.75	1.2
13	.7	1.75	2.1	2.05	2.4	1.95	1.5	28	1.25	1.8	2.0	1.6	2.1	1.75	1.2
14	.7	1.75	2.05	2.05	2.4	1.9	1.55	29	1.3	1.7	1.9	1.8	2.0	1.75	1.2
15	.7	1.7	2.0	2.05	2.5	1.9	1.55	30	1.3	1.7	2.1	2.05	2.0	1.65	1.15
								31	.....	1.7	.....	2.1	2.0	.....	1.15

Daily discharge, in second-feet, of Kiona canal near Kiona, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1....	11	16	24	31	23	21	19	16....	11	26	28	28	29	21	18
2....	5.4	17	25	31	24	21	18	17....	11	28	26	27	29	21	18
3....	5.4	20	27	30	26	21	19	18....	11	27	24	26	29	21	17
4....	5.4	21	28	28	26	21	19	19....	13	28	23	24	29	21	17
5....	5.4	23	28	28	26	22	18	20....	13	28	20	23	30	21	17
6....	5.4	23	28	28	26	21	18	21....	14	0	21	23	30	21	17
7....	5.4	0	28	28	26	21	18	22....	15	21	23	21	29	20	16
8....	6.7	12	28	29	26	22	19	23....	15	28	24	14	22	21	14
9....	6.7	20	28	24	0	22	18	24....	15	28	26	13	23	22	15
10....	6.7	21	29	24	26	22	17	25....	15	28	26	17	21	19	16
11....	8.1	21	30	27	27	22	17	26....	16	28	24	17	21	20	14
12....	8.1	24	30	27	27	22	17	27....	17	26	23	17	22	20	14
13....	9.1	25	31	27	27	21	17	28....	17	26	29	16	22	20	14
14....	9.1	25	30	26	27	21	18	29....	18	24	28	19	21	20	14
15....	9.1	24	29	26	29	21	18	30....	18	24	31	23	21	18	14
								31....	.....	24	.....	24	21	.....	14

NOTE.—Daily discharge Apr. 1 to June 30 determined from a well-defined rating curve. Discharge July 1 to Oct. 31 determined by indirect method to eliminate effect of backwater caused by the growth of weeds in canal; correction curve fairly well defined.

Monthly discharge of Kiona canal near Kiona, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Apr	18	5.4	10.9	649	A.
May	28	.0	22.1	1,360	A.
June	31	20	26.6	1,580	A.
July	31	13	24.1	1,480	B.
August	30	.0	24.7	1,520	B.
September	22	18	20.9	1,240	B.
October	19	14	16.7	1,030	B.
The season	31	.0	20.9	8,860	

KENNEWICK CANAL NEAR RICHLAND, WASH.

The Kennewick canal, which is one of the largest in Yakima Valley, is owned and operated by the Northern Pacific Irrigation Co. It takes water from the right bank of Yakima River at Horn Rapids in sec. 3, T. 10 N., R. 27 E., about 11 miles north of Kiona. It irrigates approximately 14,000 acres of land given over to diversified farming.

The gaging station was established in 1904 at a bridge 1¼ miles below the head gates. After the irrigating season of 1905 the station was discontinued. On April 1, 1910, it was reestablished and the gage removed to a point about 150 feet below the headgate and above the first spill.

Owing to the short distance between the head gate and the gage the accuracy of results is diminished by the velocity of approach through the head gate.

Discharge measurements of Kennewick canal near Kiona, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 1	H. Kimble	26	46.2	2.2	93
May 9	.....do	28	75.2	3.2	181
June 6	.....do	27.5	76	3.27	191
Aug. 2	.....do	29	88.2	3.65	204
Sept. 5	F. B. Storey	28	85.3	3.5	190
15	.....do	28	83.1	3.46	187

Daily gage height, in feet, of Kennewick canal near Kiona, Wash., for 1910.

[E. A. Thamke, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1....	2.20	3.00	3.25	3.50	3.65	3.50	3.00	16....	2.30	3.22	3.40	3.65	3.58	3.40	2.85
2....	2.20	3.10	3.25	3.52	3.65	3.50	2.90	17....	2.70	3.22	3.40	3.65	3.58	3.40	2.85
3....	2.20	3.10	3.25	3.52	3.65	3.50	3.00	18....	2.70	3.22	3.40	3.65	3.55	3.40	2.85
4....	2.20	3.10	3.25	3.55	3.60	3.50	2.90	19....	2.70	3.22	3.40	3.68	3.55	3.40	2.85
5....	2.20	3.10	3.25	3.55	3.62	3.50	2.90	20....	2.90	3.22	3.40	3.68	3.55	3.35	2.80
6....	2.50	3.10	3.25	3.60	3.62	3.50	2.85	21....	2.90	3.22	3.40	3.68	3.55	3.35	2.80
7....	2.50	3.15	3.25	3.60	3.65	3.50	2.85	22....	3.00	3.22	3.40	3.68	3.55	3.35	2.80
8....	2.60	3.18	3.28	3.62	3.65	3.10	2.85	23....	3.10	3.22	3.40	3.65	3.55	dry	2.80
9....	2.70	3.20	3.28	3.65	1.60	2.90	2.85	24....	2.30	3.22	3.40	3.65	3.55	dry	2.80
10....	2.70	3.20	3.35	3.65	1.80	3.20	2.85	25....	2.70	3.25	3.45	3.65	3.55	3.25	2.80
11....	1.50	3.20	3.35	3.68	3.65	3.48	2.85	26....	2.70	3.25	3.45	3.65	3.55	3.10	2.75
12....	1.50	3.20	3.38	3.70	3.65	3.48	2.85	27....	2.70	3.22	3.45	3.65	3.55	3.10	2.75
13....	1.60	3.25	3.38	3.70	3.65	3.45	2.85	28....	2.70	3.25	3.48	3.65	3.55	3.10	2.75
14....	1.60	3.25	3.38	dry	3.60	3.42	2.85	29....	2.90	3.25	3.48	3.65	3.50	3.10	2.75
15....	2.30	3.22	3.40	3.60	3.60	3.42	2.85	30....	3.00	3.25	3.50	3.65	3.50	3.10	2.75
								31....	.....	3.25	.....	3.65	3.50	.....	2.75

Daily discharge, in second-feet, of Kennewick canal near Kiona, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1....	94	164	189	214	205	190	141	16....	102	186	204	209	198	180	128
2....	94	174	189	214	205	190	132	17....	136	186	204	209	198	180	128
3....	94	174	189	214	205	190	141	18....	136	186	204	209	195	180	128
4....	94	174	189	214	200	190	132	19....	136	186	204	209	195	180	128
5....	94	174	189	214	202	190	132	20....	154	186	204	209	195	175	123
6....	118	174	189	214	202	190	128	21....	154	186	204	209	195	175	123
7....	118	179	189	214	205	190	128	22....	164	186	204	209	195	175	123
8....	127	182	192	214	205	150	128	23....	174	186	204	205	195	0	123
9....	136	184	192	214	27	132	128	24....	102	186	204	205	195	0	123
10....	136	184	199	214	41	160	128	25....	136	189	209	205	195	165	123
11....	42	184	199	214	205	188	128	26....	136	189	209	205	195	150	118
12....	42	184	202	214	205	188	128	27....	136	186	209	205	195	150	118
13....	49	189	202	214	205	185	128	28....	136	189	212	205	195	150	118
14....	49	189	202	0	200	182	128	29....	154	189	212	205	190	150	118
15....	102	186	204	209	200	182	128	30....	164	189	214	205	190	150	118
								31....	.....	189	.....	205	190	.....	118

NOTE.—The velocity of the water at this station varies with the height of the river on the gates on account of the proximity of the gage to the headworks. Two fairly well-defined rating curves have been used, the first applicable Apr. 1 to June 30, and the second Aug. 1 to Oct. 31. Discharge for July estimated by a transition between the curves; subject to considerable error.

Monthly discharge of Kennewick canal near Kiona, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	174	42	117	6,960	B.
May	189	164	184	11,300	B.
June	214	189	201	12,000	B.
July	214	0	203	12,500	C.
August	205	27	188	11,600	B.
September	190	0	162	9,640	B.
October	141	118	126	7,750	B.
The season	214	0	169	71,800	

LOWER YAKIMA CANAL NEAR KIONA, WASH.

The Lower Yakima canal, formerly known as the Grosscup canal, diverts water from Yakima River at Horn Rapids directly opposite the intake of the Kennewick canal, in sec. 3, T. 10 N., R. 27 E. Together with the Amon canal, it is owned and operated by the Benton Water Co., which took over the old Grosscup canal and extended it. Diversified farming, especially the raising of small fruits, is practiced on the land under this ditch.

The station was established in 1905 at the highway bridge 1 mile below the head gate. No water was diverted in 1904. No records were obtained between 1905 and 1909. On May 10, 1910, at the beginning of the irrigating season, the station was reestablished just below the controlling spill, one-fourth mile below the intake.

The results at this station are of high accuracy.

Discharge measurements of Lower Yakima canal near Kiona, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 10	H. Kimble	.....	50.7	3.00	89
June 6	.....do	22.7	62.2	3.52	117
Aug. 2	.....do	24	76.2	4.1	146
Sept. 5	F. B. Storey	26	68.4	3.68	122

Daily gage height, in feet, and discharge, in second-feet, of Lower Yakima canal near Kiona, Wash., for 1910.

[Fred Sleight, observer.]

Day.	May.		June.		July.		Aug.		Sept.		Oct.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	3.45	112	3.85	132	4.15	148	3.50	114	3.05	92
2	.....	.....	3.45	112	3.85	132	4.15	148	3.50	114	3.00	89
3	.....	.....	3.45	112	3.85	132	4.10	145	3.58	118	3.00	89
4	.....	.....	3.50	114	3.85	132	4.05	142	3.65	122	2.85	82
5	.....	.....	3.55	116	3.85	132	4.05	142	3.65	122	2.70	74
6	.....	.....	3.55	116	3.85	132	4.02	140	3.65	122	2.70	74
7	.....	.....	3.55	116	3.85	132	4.00	139	3.65	122	2.75	76
8	.....	.....	3.55	116	3.85	132	4.00	139	3.35	106	2.85	82
9	.....	.....	3.55	116	3.90	134	3.40	109	3.30	104	2.90	84
10	3.00	89	3.55	116	3.95	136	2.45	63	3.35	106	2.98	86
11	3.05	92	3.55	116	3.95	136	3.75	126	3.65	122	3.05	92
12	3.00	89	3.55	116	3.95	136	3.90	134	3.58	118	3.05	92
13	3.00	89	3.55	116	3.95	136	3.80	129	3.50	114	3.05	92
14	1.50	26	3.55	116	3.95	136	3.70	124	3.50	114	3.05	92
15	1.35	22	3.55	116	3.95	136	3.65	122	3.50	114	3.05	92
16	3.08	93	3.55	116	3.98	138	3.60	119	3.50	114	3.05	92
17	3.22	100	3.55	116	4.00	139	3.60	119	3.50	114	3.05	92
18	3.35	106	3.60	119	4.05	142	3.60	119	3.50	114	3.05	92
19	3.35	106	3.65	122	4.12	146	3.65	122	3.50	114	3.05	92
20	3.35	106	3.65	122	4.15	148	3.70	124	3.50	114	3.05	92
21	3.35	106	3.65	122	4.15	148	3.70	124	3.40	109	3.05	92
22	3.35	106	3.65	122	4.15	148	3.70	124	3.30	104	3.05	92
23	3.35	106	3.65	122	4.15	148	3.65	122	3.30	104	3.05	92
24	3.38	108	3.65	122	4.15	148	3.50	114	3.30	104	3.05	92
25	3.40	109	3.70	124	4.15	148	3.50	114	3.25	102	2.92	86
26	3.50	114	3.70	124	4.15	148	3.50	114	3.20	99	2.80	79
27	3.52	115	3.70	124	4.15	148	3.50	114	3.20	99	2.70	74
28	3.45	112	3.72	125	4.15	148	3.50	114	3.20	99	2.60	69
29	3.45	112	3.80	129	4.15	148	3.50	114	3.15	96	2.60	69
30	3.45	112	3.85	132	4.15	148	3.50	114	3.10	94	2.60	69
31	3.45	112	.....	.....	4.15	148	3.50	114	.....	.....	1.30	20

NOTE.—Daily discharge determined from a well-defined rating curve. No backwater caused by weeds at this station in 1910.

Monthly discharge of Lower Yakima canal near Kiona, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 10-31	114	22	96.8	4,220	A.
June	132	112	119	7,080	A.
July	148	132	140	8,610	A.
August	148	63	124	7,630	A.
September	122	94	110	6,550	A.
October	92	20	83.3	5,120	A.
The season	148	20	113	39,200	

CANALS TAKING WATER FROM NACHES RIVER.

SELAH VALLEY CANAL NEAR NACHES, WASH.

The Selah Valley canal heads in the left bank of Naches River about 1 mile above the mouth of the Tieton, in sec. 35, T. 15 N., R. 16 E. The canal irrigates considerable land in the Naches Valley and a large amount of bench land in the Selah Valley. It is one of the most important canals diverting from the Naches River. The area under irrigation in 1905 was 9,000 acres, but it has probably been increased.

The gaging station was established in the spring of 1904 in a flume about a mile below the gage. It was discontinued in the fall of 1905, but was reestablished in July, 1909, by the United States Reclamation Service. As the station was below a section where the seepage loss is very great, it was moved in the spring of 1910 to a point above the first spill, 800 feet below the headgate.

The rating curve during 1910 is excellent and the results are accurate.

Discharge measurements of Selah Valley canal near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 19	H. Kimble	18.0	31.5	1.25	49.5
May 13	do	18.3	45.4	2.00	85.2
19	do	18.3	49.7	2.25	114
June 17	H. D. McGlashan	19.0	48.2	2.19	106
July 6	H. Kimble	18.4	51.3	2.35	115
Aug. 10	do	18.5	53.4	2.40	122

Daily gage height, in feet, of Selah Valley canal near Naches, Wash., for 1910.

[W. H. Johnson, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	1.9	2.3	2.4	2.4	2.5	1.9	16	.....	2.2	2.2	2.4	2.4	2.3	1.5
2	.....	1.9	2.3	2.4	2.4	2.5	2.0	17	.....	2.2	2.3	2.4	2.5	2.3	1.5
3	.....	1.9	2.1	2.3	2.4	2.5	2.0	18	.....	2.2	2.3	2.4	2.5	2.3	1.5
4	.....	1.9	2.1	2.3	2.4	2.5	1.9	19	1.25	2.2	2.3	2.4	2.5	2.3	1.5
5	.....	1.9	2.3	2.3	2.4	2.5	1.9	20	1.3	Dry.	2.3	2.4	2.5	2.2	1.5
6	.....	1.9	2.3	2.3	2.4	2.5	1.7	21	1.3	2.25	2.2	2.4	2.5	2.2	1.5
7	.....	2.0	2.2	1.7	2.4	2.5	1.7	22	1.4	2.3	2.2	2.4	2.5	2.2	1.5
8	.....	2.3	2.2	1.7	2.4	2.5	1.7	23	1.45	2.3	2.2	2.4	2.5	2.1	1.3
9	.....	2.3	2.1	1.7	2.4	2.5	1.7	24	1.6	2.3	2.2	2.4	2.5	2.1	1.3
10	.....	2.1	2.1	2.4	2.4	2.5	1.7	25	1.6	2.3	2.2	2.4	2.5	2.1	1.5
11	.....	2.1	2.2	2.4	2.4	2.5	1.7	26	1.5	2.3	2.4	2.4	2.5	2.0	1.5
12	.....	2.0	2.3	2.4	2.4	2.5	1.6	27	1.6	2.3	2.4	2.4	2.5	2.0	1.3
13	.....	2.0	2.3	2.4	2.4	2.3	1.6	28	1.8	2.3	2.3	2.4	2.5	1.9	1.3
14	.....	2.0	2.3	2.4	2.4	2.3	1.5	29	1.8	2.2	2.3	2.4	2.5	1.9	1.3
15	.....	2.2	2.2	2.4	2.4	2.3	1.5	30	1.8	2.2	2.3	2.4	2.5	1.9	1.3
								31	.....	2.2	.....	2.4	2.5	.....	.....

Daily discharge, in second-feet, of Selah Valley canal near Naches, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	88	114	120	120	127	88	16	.....	108	108	120	120	114	64
2	.....	88	114	120	120	127	94	17	.....	108	114	120	127	114	64
3	.....	88	101	114	120	127	94	18	.....	108	114	120	127	114	64
4	.....	88	101	114	120	127	88	19	50	108	114	120	127	114	64
5	.....	88	114	114	120	127	88	20	54	0	114	120	127	108	64
6	.....	88	114	114	120	127	75	21	54	110	108	120	127	108	64
7	.....	94	108	75	120	127	75	22	58	114	108	120	127	108	64
8	.....	114	108	75	120	127	75	23	61	114	108	120	127	101	54
9	.....	114	101	75	120	127	75	24	69	114	108	120	127	101	54
10	.....	101	101	120	120	127	75	25	69	114	108	120	127	101	64
11	.....	101	108	120	120	127	75	26	64	114	120	120	127	94	64
12	.....	94	114	120	120	127	69	27	69	114	120	120	127	94	54
13	.....	94	114	120	120	114	69	28	82	114	114	120	127	88	54
14	.....	94	114	120	120	114	64	29	82	108	114	120	127	88	54
15	.....	108	108	120	120	114	64	30	82	108	114	120	127	88	54
								31	.....	108	.....	120	127	.....	.....

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Selah Valley canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 19-30	82	50	66.2	1,580	A.
May	114	0	100	6,150	A.
June	114	101	111	6,600	A.
July	120	75	115	7,070	A.
August	127	120	123	7,560	A.
September	127	88	113	6,720	A.
October 1-30	94	54	68.9	4,100	A.
The season	127	0	102	39,800	

WAPATOX CANAL NEAR NACHES, WASH.

The Wapatox canal heads in the left bank of Naches River in sec. 36, T. 15 N., R. 16 E., one-half mile below the mouth of Tieton River.

The station was established May 18, 1904, at a point 200 feet below the headgates, and was abandoned after the season of 1905.

After this date the Northwest Light & Power Co. (now Pacific Light & Power Co.) enlarged the canal and constructed the Wapatox power plant 9 miles below the intake, returning at this point all water not used for irrigation. The canal is still used all along its course for irrigation in upper Naches Valley, and just above the power-house penstocks the Lower Wapatox canal diverts water for irrigation of Rose Hill and the benches below it.

In July, 1909, a station was established by the United States Reclamation Service on the Wapatox canal near the intake. The gage is a staff nailed to the Bohemian ranch bridge. Discharge measurements are made from the bridge about one-half mile below the head gates. A station was also established in the tunnel in sec. 13, T. 14 N., R. 17 E., one-fourth mile above the power house,

measurements being made from a footboard. The difference of discharge between these two stations is assumed to be the amount taken out of the main Wapatox canal for irrigation, and, added to the discharge of the Lower Wapatox canal, it indicates the total water used for irrigation by the Wapatox Canal Co.

The results obtained at both stations on the main canal are excellent.

A gage was also established in July, 1909, by the United States Reclamation Service on the Lower Wapatox canal in the flume about 100 feet below the intake. The results here are affected by backwater.

The results for the station at the intake are published in full; those for the station at the power house and on the Lower Wapatox in condensed form.

Discharge measurements of Wapatox canal at intake, near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 31	H. Kimble	25	64	1.65	153
Apr. 19	.....do	26.5	76.3	2.05	195
May 20	.....do	26	73.8	1.95	184
July 11	.....do	27	83.2	2.38	229
Aug. 10	.....do	27	82.8	2.39	206

Discharge measurements of Wapatox Power canal at power house, near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 31	H. Kimble	14.6	50	3.6	158
Apr. 19	.....do	14.6	49	3.5	173
May 20	.....do	14.6	44.7	3.2	158
July 6	.....do	14.6	51.6	3.57	186

Discharge measurements of Lower Wapatox canal near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 31	H. Kimble	.....	3.2	0.90	4.7
Apr. 20	.....do	.....	5.29	1.20	11.8
May 20	.....do	.....	5.68	1.25	13.7
Sept. 13	.....do	.....	5.2	1.10	9.88

Daily gage height, in feet, of Wapatox canal at intake, near Naches, Wash., for 1910.

[Nick Johnson, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1....	1.6	1.9	2.3	2.4	.....	2.45	.....	16....	2.0	1.9	2.3	2.3	2.4	2.8	2.75
2....	1.6	1.9	2.3	2.4	.....	2.5	2.75	17....	2.0	2.0	2.2	2.25	2.4	2.8	2.7
3....	1.6	1.9	2.3	2.4	.....	2.55	2.8	18....	2.0	2.05	2.2	2.3	2.45	2.75	2.75
4....	1.6	1.9	1.9	2.4	.....	2.6	2.95	19....	2.05	2.05	2.3	2.3	2.45	2.8	2.75
5....	1.6	2.05	2.3	2.4	.....	2.65	2.75	20....	2.05	2.05	2.3	2.4	2.45	2.8	2.7
6....	1.6	2.05	2.4	2.4	.....	2.7	2.75	21....	2.05	2.2	2.3	2.4	2.45	2.75	2.75
7....	1.6	1.95	2.3	2.4	.....	2.6	2.65	22....	2.05	2.2	2.2	2.4	2.45	2.7	2.75
8....	1.6	1.9	2.3	2.35	2.4	2.6	2.75	23....	2.0	2.2	2.2	.....	2.45	2.75	2.7
9....	1.6	1.9	2.3	2.4	2.4	2.55	2.7	24....	1.9	2.2	2.3	.....	2.45	2.75	2.75
10....	1.6	1.9	2.3	2.4	2.4	2.7	2.7	25....	1.9	2.2	2.3	.....	2.4	2.75	2.8
11....	1.6	1.85	2.3	2.35	2.45	2.7	2.75	26....	1.85	2.2	2.3	.....	2.45	2.75	2.7
12....	2.0	1.9	2.2	2.35	2.5	2.75	2.75	27....	1.8	2.2	2.3	.....	2.4	2.8	2.75
13....	2.05	1.9	2.3	2.35	2.45	2.75	2.75	28....	1.8	2.3	2.3	.....	2.45	2.75	2.7
14....	2.0	1.9	2.3	2.4	2.45	2.75	2.7	29....	1.8	2.3	2.35	.....	2.5	2.75	2.75
15....	1.9	1.95	2.3	2.35	2.4	2.8	2.7	30....	1.95	2.35	2.35	.....	2.5	2.8	2.75
								31....	.....	.....	.....	.....	2.5	.....	2.75

Daily discharge, in second-feet, of Wapatox canal at intake, near Naches, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1....	149	179	219	229	229	234	269	16....	189	179	219	219	229	272	266
2....	149	179	219	229	229	239	266	17....	189	189	209	214	229	272	261
3....	149	179	219	229	229	244	272	18....	189	194	209	219	234	266	266
4....	149	179	179	229	229	250	290	19....	194	194	219	219	234	272	266
5....	149	194	219	229	229	256	266	20....	194	194	219	229	234	272	261
6....	149	194	229	229	229	261	266	21....	194	209	219	229	234	266	266
7....	149	184	219	229	229	250	256	22....	194	209	209	229	234	261	266
8....	149	179	219	224	229	250	266	23....	189	209	209	229	234	266	261
9....	149	179	219	229	229	256	261	24....	179	209	219	229	234	266	266
10....	149	179	219	229	229	261	261	25....	179	209	219	229	229	266	272
11....	149	174	219	224	234	261	266	26....	174	209	219	229	234	266	261
12....	190	179	209	224	239	266	266	27....	169	209	219	229	229	272	266
13....	194	179	219	224	234	266	266	28....	169	219	219	229	234	266	261
14....	191	179	219	229	234	266	261	29....	169	219	224	229	239	266	266
15....	179	184	219	224	229	272	261	30....	184	224	224	229	239	272	266
								31....	.....	220	.....	229	239	.....	266

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Wapatox canal at intake, near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	194	149	171	10,200	A.
May	224	179	194	11,900	A.
June	229	179	217	12,900	A.
July	229	214	227	14,000	A.
August	239	229	232	14,300	A.
September	272	234	262	15,600	A.
October	290	256	265	16,300	A.
The season	290	149	224	95,200	

Monthly discharge of Wapatox canal at power house, near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	179	142	157	9,340	B.
May	176	149	166	10,200	B.
June	189	164	176	10,500	B.
July	182	166	174	10,700	B.
August	189	172	182	11,200	B.
September	228	179	205	12,200	B.
October	211	206	207	12,700	B.
The season	228	142	181	76,800	

Monthly discharge of Lower Wapatox canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	14	4.8	8.73	519
May	15	.0	12.5	769
June	16	13	14.8	881
July	16	13	14.1	867
August	13	.0	10.9	670
September	12	6.4	9.25	550
October	9.6	6.7	8.36	514
The season	16	.0	11.2	4,770

NACHES CANAL CO. (GLEED) CANAL NEAR NACHES, WASH.

The Naches Co. canal diverts from the left bank of Naches River in sec. 24, T. 14 N., R. 17 E., to irrigate land in the lower Naches Valley.

The gaging station was established in May, 1904, and records were obtained during 1904, 1905, and part of 1906. On June 22, 1909, the station was reestablished. The gage is about three-eighths mile below the head gate on the ranch of Edward Kershaw.

The relation of gage height to discharge in this canal is affected by accumulations of mud, which scoured out at high water, and by diminished velocity caused by overhanging sweet clover which grows along the banks.

Discharge measurements of Naches Canal Co. (Gleed) canal near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 14[a]	H. Kimble			0.7	12
31	do	10	13.3	0.5	4.1
Apr. 20	do	13	35.5	2.18	67.5
July 6	do	13	31.6	1.9	50.1
Aug. 10	do	14	46	2.93	82.8
Sept. 13	do	13	28.4	1.7	34.6

[a] Float measurement.

Daily gage height, in feet, and discharge, in second-feet, of Naches Canal Co. (Gleed) canal near Naches, Wash., for 1910.

[Edw. Kirshaw, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	0.5	4.0	2.4	75	2.4	75	2.2	63	2.2	52	2.2	45
2	.5	4.0	2.6	87	2.3	69	2.2	63	2.2	52	2.2	45
3	.5	4.0	2.6	87	2.2	63	2.2	63	2.2	51	2.2	47
4	.5	4.0	2.4	75	2.2	63	2.0	51	Dry.	0	2.2	49
5	.5	4.0	2.0	51	2.6	87	1.9	45	Dry.	0	2.2	52
6	.5	4.0	2.0	51	2.4	75	1.9	45	2.2	49	2.2	54
7	.8	7.0	2.2	63	2.2	63	2.4	75	.....	83	2.0	45
8	.8	7.0	2.6	87	2.2	63	2.4	75	.....	83	2.0	46
9	.9	8.5	2.5	81	2.3	69	2.5	80	.....	83	2.1	53
10	.9	8.5	2.4	75	2.3	69	2.3	68	2.93	83	2.1	54
11	.9	8.5	2.4	75	2.3	69	2.3	68	.....	83	1.7	34
12	.9	8.5	2.4	75	2.3	69	2.4	73	.....	83	1.7	34
13	.9	8.5	2.4	75	2.5	81	2.3	67	.....	83	1.6	30
14	1.5	26	2.3	69	2.4	75	2.3	66	2.0	37	1.6	30
15	2.0	51	2.3	69	2.4	75	2.3	66	1.9	32	1.6	30
16	2.1	57	2.3	69	2.3	69	2.1	54	1.9	32	1.6	30
17	2.1	57	2.3	69	2.1	57	2.0	48	1.9	32	1.6	30
18	2.3	69	2.4	75	2.1	57	1.9	42	2.5	56	1.6	30
19	2.3	69	2.3	69	1.8	40	1.9	41	2.5	56	1.6	30
20	2.2	63	2.3	69	2.3	69	2.6	80	2.4	51	1.6	30
21	2.1	57	2.4	75	2.0	51	2.4	68	2.3	47	1.6	30
22	2.1	57	2.4	75	1.8	40	2.3	62	2.3	47	1.6	30
23	2.2	63	2.4	75	1.8	40	2.3	62	2.3	47	1.6	30
24	2.4	75	2.4	75	1.8	40	2.3	61	2.3	47	.....	.....
25	2.3	69	2.4	75	1.8	40	2.2	55	2.3	47	.....	.....
26	2.3	69	2.3	69	1.8	40	2.5	70	2.3	47	.....	.....
27	2.4	75	2.4	75	1.8	40	2.4	65	2.4	51	.....	.....
28	2.6	87	2.4	75	1.8	40	2.3	59	2.4	51	.....	.....
29	2.6	87	2.4	75	1.8	40	2.3	59	2.4	51	.....	.....
30	2.6	87	2.3	69	1.6	30	2.3	58	2.3	48	.....	.....
31	.....	.....	2.4	75	.....	.....	2.2	52	2.2	44	.....	.....

NOTE.—Daily discharge Apr. 1 to July 8 and Sept. 13 to 23 determined from a fairly well-defined rating curve. Gage heights during the interim affected by backwater caused by growth of weeds and accumulation of mud; correction curve for this period is based on only one discharge measurement and on a study of the effect of weeds in 1911 and is poorly defined.

Monthly discharge of Naches Canal Co. (Gleed) canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	87	4.0	40.0	2,380	B.
May	87	51	72.9	4,480	B.
June	87	30	58.6	3,496	B.
July	80	41	61.4	3,780	C.
August	83	.0	51.9	3,190	C.
September 1-23	54	30	38.6	1,760	C.
The season	87	.0	54.6	19,100	

YAKIMA VALLEY (CONGDON) CANAL NEAR NACHES, WASH.

The Yakima Valley (Congdon) canal heads in the right bank of the Naches River in sec. 24, T. 14 N., R. 17 E., extends by flume to Cowiche Creek, which it crosses by an inverted siphon of two pipes, and irrigates about 4,200 acres of fruit land west of North Yakima.

The gaging station was established on May 1, 1904, and records were obtained in parts of the seasons of 1904, 1905, and 1906. On August 31, 1906, the station was suspended. It was reestablished July 7, 1909, by the United States Reclamation Service. The gage is about 200 feet below the head gate and has not been changed since reestablishment.

The rating curve is excellent and the results are very accurate.

Discharge measurements of Yakima Valley (Congdon) canal near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	H. Kimble	7.9	12.8	1.02	22
May 3	do	7.9	18.5	1.72	36.6
21	F. C. Ebert	8.1	20.9	2.02	46.4
21	H. Kimble	8.1	20.3	2.02	46.8
July 5	do	8.1	20.6	2.06	48.5
Sept. 13	do	8.0	18	1.69	36.6

Daily gage height, in feet, and discharge, in second-feet, of Yakima Valley (Congdon) canal near Naches, Wash., for 1910.

[T. E. Young, observer.]

Day.	April.		May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.70	37	2.04	47	2.20	53	1.98	45
2			1.70	37	2.04	47		53	1.98	45
3			1.72	37	2.04	47	2.20	53	1.98	45
4			1.72	37	2.04	47	2.20	53	1.98	45
5			1.72	37	2.00	46	2.20	53	1.98	45
6			1.80	40	2.00	46	2.20	53	1.98	45
7			1.90	43	2.00	46	2.20	53	2.28	56
8			1.90	43	2.00	46	2.20	53	2.28	56
9			1.98	45	2.00	46	2.20	53	2.28	56
10			2.00	46	2.00	46	2.20	53	2.28	56
11			2.04	47	2.00	46	2.20	53	2.28	56
12			2.04	47	2.00	46	2.30	56	2.28	56
13			2.04	47	2.00	46	2.30	56	2.28	56
14			2.04	47	2.00	46	2.30	56	2.28	56
15			2.04	47	2.00	46	2.30	56	2.28	56
16			2.04	47	2.00	46	2.30	56	2.28	56
17			2.04	47	2.00	46	2.30	56	2.28	56
18			2.04	47	2.00	46	2.30	56	2.28	56
19	1.00	22	2.04	47	2.00	46	2.30	56	2.28	56
20	1.10	23	2.04	47	2.00	46	2.30	56	2.28	56
21	1.20	24	2.04	47	2.00	46	2.30	56	2.31	57
22	1.30	26	2.04	47	2.10	50	2.30	56	2.31	57
23	1.30	26	2.04	47	2.10	50	2.30	56	2.31	57
24	1.30	26	2.04	47	2.10	50	2.00	46	2.31	57
25	1.30	26	2.04	47	2.00	46	2.00	46	2.31	57
26	1.50	31	2.04	47	2.20	53	2.00	46	2.31	57
27	1.60	34	2.04	47	2.20	53	2.00	46	2.28	56
28	1.60	34	Dry.	0	2.20	53	2.00	46		
29	1.60	34	Dry.	0	2.20	53	2.00	46		
30	1.60	34	2.00	46	2.20	53	2.00	46		
31			2.04	47			1.98	45		

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Yakima Valley (Congdon) canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 19-30	34	22	28.3	674	A.
May	47	0	41.7	2,560	A.
June	53	46	47.7	2,840	A.
July	56	45	52.3	3,220	A.
August 1-27	57	45	53.8	2,880	A.
The season	57	0	46.9	12,200	

NACHES-COWICHE CANAL NEAR NORTH YAKIMA, WASH.

The Naches-Cowiche canal diverts from the right bank of the Naches in sec. 9, T. 13 N., R. 18 E., just below Nelson's bridge at Cowiche Gap. About three-eighths mile below the head gate it crosses Cowiche Creek, from which it takes nearly all its water in the early part of the season. It irrigates land west and southwest or North Yakima.

The station was established on May 4, 1904, and records were obtained for the seasons of 1904, 1905, and part of 1906. In July, 1909, the station was reestablished by the United States Reclamation Service. The gage is on the Huff ranch about one-half mile below the head gate.

The relation of gage height to discharge in this canal is affected by growth of weeds.

Discharge measurements of Naches-Cowiche canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 18	H. Kimble	10.5	11.4	1.65	13.3
May 5	do	11.1	18.4	2.33	31.0
July 14	do	8.4	17.2	2.70	37.0
25	do	9.0	17.2	2.64	31.8
Sept. 14	do	8.2	16.0	2.18	19.7

Daily gage height, in feet, of Naches-Cowiche canal near North Yakima, Wash., for 1910.

[Gordon Tongue, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	2.10	2.45	2.70	2.90	2.60	1.60	16	1.35	2.35	2.60	2.79	.....	1.72	1.65
2	.....	2.12	2.45	2.75	2.87	2.65	1.60	17	.....	2.40	2.45	2.79	.....	1.90	1.60
3	.....	2.25	2.45	2.80	2.80	2.60	1.50	18	1.65	2.45	2.35	2.80	.....	1.96	1.65
4	.....	2.27	2.45	2.80	2.85	2.50	1.60	19	.....	.....	2.20	2.86	.....	2.03	1.07
5	.....	2.33	2.45	2.80	Dry.	2.58	1.65	20	.....	1.05	2.30	2.75	.....	1.98	1.05
6	.....	2.32	2.20	2.80	Dry.	2.50	1.65	21	1.90	2.30	2.35	2.65	.....	1.88	1.06
7	.....	2.35	2.25	2.85	Dry.	2.50	1.65	22	2.20	2.30	2.35	2.61	2.80	1.60	1.05
8	.....	2.42	2.25	2.85	Dry.	2.43	1.61	23	2.30	2.35	2.30	2.60	2.80	1.60	1.06
9	.....	2.48	2.30	2.85	Dry.	2.40	1.55	24	2.30	2.30	2.25	2.64	2.83	1.70	1.05
10	.....	2.52	2.40	2.85	Dry.	2.39	1.60	25	2.32	2.30	2.30	2.64	2.83	1.68	1.06
11	Dry.	2.50	2.40	2.80	Dry.	2.40	1.59	26	.72	2.40	2.40	2.65	2.78	1.65	1.05
12	1.00	2.32	2.35	2.75	1.75	2.41.	1.61	27	.70	2.45	2.45	2.75	2.80	1.70	1.04
13	1.00	2.30	2.30	2.70	2.40	2.30	1.59	28	2.05	2.45	2.55	2.75	2.80	1.70	1.05
14	1.15	2.30	2.30	2.70	.....	2.20	1.67	29	2.12	2.40	2.60	2.85	2.70	1.70	1.03
15	1.36	2.30	2.30	2.70	.....	2.05	1.65	30	2.10	2.35	2.65	2.89	2.70	1.65	1.04
								31	.....	2.45	.....	2.90	2.72	.....	1.03

Daily discharge, in second-feet, of Naches-Cowiche canal near North Yakima, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	24	35	37	40	31	9.1	16	8.6	32	41	40	28	11	9.8
2	.....	24	35	38	39	32	9.1	17	10	34	35	40	30	14	9.1
3	.....	29	35	40	37	31	7.7	18	13	35	32	40	31	15	9.8
4	.....	29	35	40	38	28	9.1	19	15	20	27	42	32	17	3.4
5	.....	31	35	40	0	30	9.8	20	17	5.4	30	38	34	16	3.2
6	.....	31	27	40	0	28	9.8	21	19	30	32	36	36	14	3.3
7	.....	32	29	42	0	28	9.8	22	27	30	32	34	37	9.1	3.2
8	.....	34	29	42	0	26	9.2	23	30	32	30	34	37	9.1	3.3
9	.....	36	30	42	0	25	8.4	24	30	30	29	35	38	11	3.2
10	.....	38	34	42	0	25	9.1	25	31	30	30	32	38	10	3.3
11	0.0	37	34	40	0	25	9.0	26	3.2	34	34	32	36	9.8	3.2
12	5.0	31	32	38	11	26	9.2	27	3.0	35	35	35	37	11	3.1
13	5.0	30	30	37	25	23	9.0	28	22	35	39	35	37	11	3.2
14	6.3	30	30	37	26	20	10	29	24	34	41	38	34	11	3.0
15	8.8	30	30	37	27	17	9.8	30	24	35	43	40	34	9.8	3.1
								31	.....	35	.....	40	34	.....	3.0

NOTE.—Daily discharge computed by the indirect method for shifting channels on account of the growth of weeds in the canal.

Monthly discharge of Naches-Cowiche canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Apr. 11–30	31	0.0	15.1	599	B.
May	38	20	30.7	1,890	B.
June	43	27	33.0	1,960	C.
July	42	32	38.2	2,350	C.
August	40	.0	25.7	1,580	C.
September	32	9.1	19.1	1,140	C.
October	10	3.0	6.72	.....	
The season	43	.0	24.7	9,930	

NORTH YAKIMA POWER CANAL NEAR NORTH YAKIMA, WASH.

The North Yakima Power canal heads in the right bank of the Naches River in sec. 10, T. 13 N., R. 18 E. It is the property of the Northwest Light & Power Co. (now the Pacific Power & Light Co.) and is used for generating electricity at a power plant about a mile west of North Yakima. Water is also diverted from it for irrigation by the Fruitvale-Schanno, R. S. & C., Schanno, Broadgage, and Naches Avenue Union canals, and by the North Yakima Milling Co. for developing power.

The gaging station was established May 5, 1904, just below the regulating gates, and records were obtained in 1904 and 1905, but the station was discontinued May 31, 1906. On July 1, 1909, the United States Reclamation Service reestablished the station and moved it downstream in sec. 15, T. 13 N., R. 18 E., to a point about 500 feet below the intake of the Fruitvale-Schanno canal and 1½ miles above the intake of the R. S. & C. canal. The chain gage is fastened to a footbridge from which measurements are made.

Results are reasonably accurate.

Discharge measurements of North Yakima Power canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 27	H. Kimble	26	76.4	3.38	163
Apr. 6	do	26	85.8	3.80	197
May 5	do	26	79.6	3.65	182
July 14	do	26	86.9	3.85	215
25	do	25	84.9	3.75	201
Nov. 22	Kimble and Storey	25	80.0	3.58	155
29	do	25	78.1	3.54	152

Daily gage height, in feet, of North Yakima Power canal near North Yakima, Wash., for 1910.

[Gordon Tongue, observer.]

Day.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	3.50	3.58	3.70	3.82	3.75	3.50	4.00	16	3.55	3.33	3.80	.....	.....	4.00	4.00
2	3.62	3.40	3.75	3.80	3.75	3.72	4.00	17	.....	3.55	3.65	.....	.....	4.07	3.89
3	3.55	3.38	3.80	3.75	3.80	3.70	3.95	18	3.62	3.75	3.30	.....	.....	3.91	4.00
4	3.45	3.75	3.80	3.80	3.75	3.26	3.98	19	.....	.....	3.65	.....	.....	3.95	3.98
5	3.60	3.65	3.70	3.80	3.80	3.32	3.91	20	.....	3.80	3.65	.....	.....	4.04	3.65
6	3.80	3.80	3.70	3.90	4.00	3.85	4.01	21	3.62	3.70	3.65	.....	.....	4.08	3.60
7	3.75	3.78	3.60	3.80	4.05	3.82	4.00	22	3.62	3.90	3.40	.....	4.00	3.92	3.50
8	3.70	3.70	3.70	3.85	4.00	3.80	4.01	23	3.61	3.70	3.30	3.80	3.90	3.92	3.40
9	3.75	3.70	3.40	3.80	3.91	3.73	4.05	24	3.70	3.80	3.70	3.65	3.85	4.03	3.25
10	3.90	3.80	3.70	3.75	3.95	3.78	3.95	25	3.68	3.70	3.80	3.75	3.85	4.00	3.95
11	3.75	3.68	3.80	3.70	3.95	3.83	3.85	26	3.62	3.75	3.80	3.60	3.78	3.98	3.85
12	3.65	3.78	3.80	3.80	3.97	4.00	3.79	27	3.60	3.85	3.70	2.00	3.80	3.97	3.70
13	3.62	3.70	3.80	3.80	3.97	3.87	3.80	28	3.55	3.70	3.70	3.48	3.80	3.97	3.60
14	3.62	3.85	3.85	3.85	.....	3.90	3.98	29	3.73	3.75	3.75	3.40	3.73	4.00	3.70
15	3.61	3.45	3.85	.....	.....	3.91	4.00	30	3.75	3.75	3.70	3.75	3.68	4.02	3.75
								31	.....	3.70	.....	3.70	3.70	.....	3.65

Daily discharge, in second-feet, of North Yakima Power canal near North Yakima, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	161	170	183	196	171	146	198	16	166	144	194	198	196	198	198
2	174	151	188	194	171	168	198	17	170	166	178	198	196	206	186
3	166	149	194	188	176	166	192	18	174	188	141	197	197	188	198
4	156	188	194	194	171	122	196	19	174	191	178	196	197	192	196
5	172	178	183	194	176	128	188	20	174	194	178	196	197	202	161
6	194	194	183	205	198	182	199	21	174	183	178	195	197	207	156
7	188	191	172	194	204	178	198	22	174	205	151	194	198	189	146
8	183	183	183	200	198	176	199	23	173	183	141	194	187	189	136
9	188	183	151	194	188	169	204	24	172	194	183	178	182	201	122
10	205	194	183	188	192	174	192	25	181	183	194	188	182	198	192
11	188	181	194	183	192	179	182	26	174	188	194	172	174	196	182
12	178	191	194	194	195	198	175	27	172	200	183	40	176	195	166
13	174	183	194	194	195	194	176	28	166	183	183	159	176	195	156
14	174	200	200	200	196	187	196	29	186	188	188	151	169	198	166
15	173	156	200	199	196	188	198	30	188	188	183	188	164	200	171
								31	.....	183	.....	183	166	.....	161

NOTE.—Daily discharge determined from a fairly well defined rating curve.

Monthly discharge of North Yakima Power canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	205	161	176	10,500	B.
May	205	149	182	11,200	B.
June	200	141	181	10,800	B.
July	205	40	185	11,400	B.
August	204	164	186	11,400	B.
September	207	122	183	10,900	B.
October	198	122	180	11,000	B.
The season	207	40	182	77,300	

SCHANNO CANAL NEAR NORTH YAKIMA, WASH.

Although the Schanno canal has a head gate on Naches River all the water that it carries is supplied by a wasteway from the power canal in sec. 13, T. 13 N., R. 18 E. It irrigates land between North Yakima and Yakima City.

The station was established in May, 1904, the gage being at a point 1,200 feet below the power canal. The station was discontinued after the irrigating season of 1905 and was reestablished about July 1, 1909, by the United States Reclamation Service, the gage being moved to a point about 100 feet below the power canal.

The relation of gage height to discharge in 1910 was somewhat affected by backwater caused by growth of weeds in the channel and by the manipulation of a current wheel 50 feet below the gage. The results are good.

Discharge measurements of Schanno canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 6	H. Kimble	9.2	5.35	0.1	7.12
18	do	7.4	3.79	−0.15	3.36
May 5	do	10.4	14.6	.93	29.3
July 14	do	10.7	17.6	1.2	35.2
Sept. 14	do	10.6	13.2	.84	21.2

Daily gage height, in feet, of Schanno canal near North Yakima, Wash., for 1910.

[Gordon Tongue, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	1.17	0.95	1.10	1.20	.....	.....	16	.....	1.10	0.75	1.20	0.92	0.83	.....
2	.....	1.10	.95	1.20	1.20	0.92	.....	17	−0.15	1.10	.70	1.20	.40	.87	.....
3	.....	.30	.95	1.10	.90	.93	.....	18	−.15	1.20	.95	1.20	.45	.60	.....
4	.....	.87	.90	1.10	.95	.85	.....	19	.....	.....	.95	1.10	.87	.60	1.07
5	.....	.93	.95	1.10	.88	.83	.....	20	1.12	1.20	1.05	1.00	.93	.60	.30
6	0.10	1.12	.90	.10	.88	.99	.....	21	1.30	1.00	1.05	1.20	.....	.65	.07
7	.....	1.10	.90	1.10	.92	.97	.....	22	1.30	1.00	.95	1.20	.95	−.05	.01
8	.....	1.10	.90	1.10	.90	.99	.....	23	1.30	1.00	.90	1.20	.95	−.10	.03
9	.....	1.12	1.00	1.10	.90	.85	.....	24	1.70	1.00	1.00	1.15	.95	−.10	.02
10	.....	1.10	1.10	1.10	.90	.80	.....	25	1.38	1.00	1.00	1.20	.95	−.15	.03
11	.....	1.10	1.10	1.20	.90	.85	.....	26	1.32	1.00	1.00	1.20	.95	−.15	.03
12	.....	1.00	1.10	1.20	.90	.85	.....	27	1.30	1.05	1.00	1.30	.95	−.15	.03
13	.81	1.00	1.10	1.20	.90	.85	.....	28	1.25	1.00	1.00	1.20	.95	−.20	.02
14	.81	.95	.75	1.20	.90	.75	.....	29	1.30	1.00	1.10	1.12	.92	−.20	.01
15	.....	.95	.70	1.20	.90	.80	.....	30	1.21	.85	1.00	1.15	.92	−.30	.02
								31	.....	.85	.....	1.26	.92	.....	.02

Daily discharge, in second-feet, of Schanno canal near North Yakima, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	35	29	33	36	24	0.0	16	0.0	33	23	36	26	21	0.0
2	.....	33	29	36	36	24	.0	17	3.0	33	22	36	12	22	.0
3	.....	12	29	33	27	24	.0	18	3.0	36	29	36	13	15	.0
4	.....	26	27	33	28	22	.0	19	.0	36	29	33	24	15	29
5	.....	28	29	33	26	22	.0	20	33	36	31	30	26	15	9.6
6	7.3	33	27	33	26	26	.0	21	38	30	31	36	26	16	5.1
7	.0	33	27	33	27	25	.0	22	38	36	29	36	26	2.1	4.0
8	.0	33	27	33	26	26	.0	23	38	30	27	36	26	1.4	4.1
9	.0	33	30	33	26	22	.0	24	50	30	30	34	26	1.4	4.4
10	.0	33	33	33	26	20	.0	25	41	30	30	36	26	.7	4.7
11	.0	33	33	36	26	22	.0	26	40	30	30	36	26	.7	4.7
12	.0	30	33	36	26	22	.0	27	38	31	30	38	26	.7	4.9
13	25	30	33	36	26	22	.0	28	37	30	30	36	25	.3	4.7
14	25	29	23	36	26	19	.0	29	38	30	33	33	24	.3	4.7
15	.0	29	22	36	25	20	.0	30	36	26	30	34	24	.0	4.9
								31	.....	26	.....	36	24	.....	5.1

NOTE.—Daily discharge Apr. 6 to July 31 determined from a fairly defined rating curve; discharge after Aug. 1 determined by indirect method for shifting channels because of growth of weeds in canal.

Monthly discharge of Schanno canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 6–30	50	0	19.6	972	B.
May	36	12	30.5	1,880	B.
June	33	22	28.8	1,710	B.
July	38	30	34.7	2,130	B.
August	36	12	25.6	1,570	C.
September	26	0	15.1	898	C.
October	29	0	2.90	178	C.
The season	50	0	22.5	9,340	

OLD UNION CANAL NEAR NORTH YAKIMA, WASH.

The Old Union canal first diverted water from Naches River in 1869. It heads in the right bank in sec. 11, T. 13 N., R. 18 E., and originally extended down the present mill waste to the headgate of the Naches Avenue Union canal, and thence down this canal. At present the canal discharges its waste water into the power waste at the Sixth Avenue crossing in North Yakima.

The gaging station was established on May 6, 1904, and records were obtained for parts of the seasons 1904, 1905, and 1906. On July 1, 1909, the station was reestablished by the United States Reclamation Service. The gage used in 1910 is the same as that used in 1909 and is located in sec. 11, T. 13 N., R. 18 E.

The relation of gage height to discharge at this station is affected by backwater caused by the manipulation of a large current wheel about 400 feet below the gage.

The total quantity of water used for irrigation by the Union Canal Co. is obtained by adding the discharges of the Old Union and Naches Avenue Union canals and subtracting therefrom the amount returned to the power waste at Sixth Avenue (the Old Union return). For the year 1910 the amount of returned water has been estimated at 5 second-feet.

Discharge measurements of Old Union canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 6	H. Kimble	13	13.1	1.81	14.3
18	do	14	15.6	2.00	23.4
May 5	do	15	29.3	2.76	34.3
July 8	do	15	32.6	2.96	37.7
14	do	15	36.8	3.1	45.8
Sept. 14	do	14	24.3	2.35	23.8

Daily gage height, in feet, of Old Union canal near North Yakima, Wash., for 1910.

[Gordon Tongue, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	1.60	2.50	3.00	2.90	3.05	2.55	2.51	16	2.10	2.65	2.95	3.10	.....	2.50	1.50
2	1.92	2.65	3.00	2.90	3.05	2.55	2.51	17	.....	2.85	2.95	3.10	.....	2.50	1.45
3	1.85	2.65	2.95	2.90	2.90	2.57	2.57	18	2.00	2.90	2.95	3.10	.....	2.55	1.80
4	1.85	2.75	2.95	2.90	2.95	2.57	1.30	19	.....	.....	2.95	3.10	.....	2.50	2.08
5	1.80	2.76	2.95	2.90	2.95	2.55	1.25	20	.....	2.83	2.95	3.10	.....	2.50	1.70
6	1.81	2.75	2.95	2.90	2.95	2.50	1.60	21	2.18	2.90	2.95	3.15	.....	2.50	1.08
7	1.80	2.77	2.95	2.95	2.90	2.56	1.59	22	2.15	2.90	2.90	3.10	2.95	2.52	1.07
8	1.80	2.25	2.60	2.95	1.30	2.40	1.43	23	2.15	2.95	2.95	3.05	2.90	2.55	1.07
9	1.80	2.77	2.90	2.95	2.92	2.40	1.40	24	2.13	2.95	2.95	3.05	2.87	2.51	1.07
10	2.15	2.78	2.90	3.15	3.00	2.35	1.40	25	2.10	2.90	2.95	3.05	2.87	2.50	1.07
11	2.05	2.75	3.00	3.10	2.90	2.36	1.40	26	2.08	2.95	2.90	3.05	2.87	2.50	1.07
12	2.15	2.62	3.00	3.15	2.95	2.36	1.70	27	2.25	3.05	2.90	3.00	2.80	2.50	1.06
13	2.07	2.55	3.00	3.10	2.95	2.37	1.60	28	2.25	3.00	2.95	3.10	2.50	2.50	1.06
14	2.10	2.55	2.95	3.10	.....	2.37	1.58	29	1.89	2.95	2.90	3.05	2.50	2.50	1.07
15	2.10	2.62	2.95	3.10	.....	2.40	1.40	30	2.65	2.95	2.90	3.03	2.50	2.50	1.07
								31	.....	3.00	.....	3.05	2.50	.....	1.07

Daily discharge, in second-feet, of Old Union canal near North Yakima, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1....	10	29	41	38	42	30	30	16....	20	33	40	43	40	29	8.6
2....	17	33	41	38	42	30	30	17....	19	37	40	43	40	29	7.7
3....	16	33	40	38	38	31	31	18....	18	38	40	43	40	30	14
4....	16	35	40	38	40	31	5.0	19....	20	38	40	43	40	29	20
5....	14	35	40	38	40	30	4.2	20....	21	37	40	43	40	29	12
6....	15	35	40	38	40	29	10	21....	22	38	40	44	40	29	1.4
7....	14	35	40	40	38	31	10	22....	22	38	38	43	40	30	1.2
8....	14	24	32	40	5.0	27	7.3	23....	22	40	40	42	38	30	1.2
9....	14	35	38	40	39	27	6.8	24....	21	40	40	42	38	30	1.2
10....	22	36	38	44	41	26	6.8	25....	20	38	40	42	38	29	1.2
11....	20	35	41	43	38	26	6.8	26....	20	40	38	42	38	29	1.2
12....	22	32	41	44	40	26	12	27....	24	42	40	41	36	29	1.0
13....	20	30	41	43	40	26	10	28....	24	41	40	43	29	29	1.0
14....	20	30	40	43	40	26	10	29....	16	40	38	42	29	29	1.2
15....	20	32	40	43	40	27	6.8	30....	33	40	38	41	29	29	1.2
								31....	.....	41	.....	42	29	.....	1.2

NOTE.—Daily discharge determined from a fairly well defined rating curve.

Monthly discharge of Old Union canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	33	10	19.2	1,140	B.
May	42	24	35.8	2,200	B.
June	41	32	39.5	2,350	B.
July	44	38	41.5	2,550	B.
August	42	5.0	37.0	2,280	B.
September	31	26	28.7	1,710	B.
October	31	1.0	8.45	520	B.
The season	44	1.0	30.0	12,800	

NACHES AVENUE UNION CANAL AT NORTH YAKIMA, WASH.

The Naches Avenue Union canal is owned and operated by the Union Canal Co., which also owns the Old Union canal. It diverts water from the North Yakima Milling Co.'s waste at the corner of Naches Avenue and E Street in the city of North Yakima. It is used to water shade trees in the city of North Yakima and to irrigate land southeast of the town.

The gaging station was established in the spring of 1904 and maintained during the irrigating seasons of 1904, 1905, and 1906. About July 1, 1909, the United States Reclamation Service reestablished the station and the gage has not been changed since that time.

The rating curve is excellent and results are highly accurate.

The discharge of this canal has been added to that of the Old Union canal to determine the total quantity of water diverted by the Union Canal Co. (See p. 269.)

Discharge measurements of Naches Avenue Union canal at North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 15	H. Kimble	5.7	6.1	0.70	8.5
Apr. 18	.....do	5.7	9.0	1.03	19.7
May 5	.....do	5.7	10.2	1.35	32.0
7	F. C. Ebert	5.7	9.2	1.30	29.1
July 14	H. Kimble	5.7	11.8	1.50	38.2

Daily gage height, in feet, of Naches Avenue Union canal at North Yakima, Wash., for 1910.

[Gordon Tongue, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	1.31	1.40	1.45	1.55	0.08	0.81	16	1.00	1.10	1.30	1.40	.....	.90	.....
2	.....	1.07	1.40	1.45	1.60	1.1	.80	17	.....	1.20	1.30	1.45	.....	.92	.....
3	.....	1.30	1.40	1.45	1.58	1.09	.29	18	1.03	1.35	1.30	1.54	.....	.90	.....
4	.....	1.40	1.40	1.45	1.60	—.03	.....	19	.....	1.38	1.40	1.40	.....	.91	.....
5	.....	1.35	1.40	1.50	1.55	.92	.....	20	.....	1.38	1.30	.....	.....	.90	.....
6	.....	1.23	1.40	1.45	1.50	1.08	.....	21	1.25	1.40	1.30	1.45	.....	.90	.....
7	.....	1.30	1.40	1.45	1.65	1.11	.....	22	1.30	1.40	1.35	1.45	1.30	.87	.....
8	0.78	1.32	1.40	1.40	1.31	1.05	.....	23	1.28	1.40	1.45	1.45	1.30	.90	.....
9	.80	1.31	1.20	1.40	1.63	1.15	.....	24	1.31	1.40	1.45	1.44	1.50	.87	.....
10	.86	1.30	1.25	1.45	1.63	1.12	.....	25	1.31	1.40	1.40	1.45	1.40	.87	.....
11	.80	1.28	1.25	1.45	1.55	1.10	.....	25	1.35	1.40	1.35	1.52	1.40	.88	.....
12	.85	1.32	1.30	1.30	1.55	.93	.....	27	1.25	1.40	1.40	.60	1.30	.86	.....
13	.90	1.30	1.20	1.45	1.60	.93	.....	28	1.12	1.40	1.45	Dry.	1.30	.85	.....
14	1.00	1.30	1.20	1.45	1.50	.92	.....	29	1.30	1.40	1.45	1.35	1.30	.83	.....
15	1.00	1.20	1.20	1.45	.....	.90	.....	30	1.32	1.40	1.45	1.6	1.10	.80	.....
								31	.....	1.40	.....	1.6	1.10	.....	.....

Daily discharge, in second-feet, of Naches Avenue Union canal at North Yakima, Wash., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	30	34	36	40	0	12	16	19	22	30	34	36	15	.....
2	.....	21	34	36	42	22	12	17	19	26	30	36	35	16	.....
3	.....	30	34	36	42	22	2	18	20	32	30	40	34	15	.....
4	.....	34	34	36	42	0	.....	19	24	33	34	34	33	16	.....
5	.....	32	34	38	40	16	.....	20	26	33	30	35	32	15	.....
6	.....	27	34	36	38	22	.....	21	28	34	30	36	31	15	.....
7	.....	30	34	36	44	23	.....	22	30	34	32	36	30	14	.....
8	11	31	34	34	30	21	.....	23	29	34	36	36	30	15	.....
9	12	30	26	34	44	24	.....	24	30	34	36	36	38	14	.....
10	14	30	28	36	44	23	.....	25	30	34	34	36	34	14	.....
11	12	29	28	36	40	22	.....	26	32	34	32	39	34	14	.....
12	13	31	30	30	40	16	.....	27	28	34	34	5.5	30	14	.....
13	15	30	26	36	42	16	.....	28	23	34	36	0	30	13	.....
14	19	30	26	36	38	16	.....	29	30	34	36	32	30	13	.....
15	19	26	26	36	37	15	.....	30	31	34	36	42	22	12	.....
								31	.....	34	.....	42	22	.....	.....

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Naches Avenue Union canal at North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Apr. 8-30	32	11	22.3	1,020	A.
May	34	21	31.0	1,910	A.
June	36	26	31.9	1,900	A.
July	42	0	33.9	2,080	A.
August	44	22	35.6	2,190	A.
September	24	0	15.8	940	A.
Oct. 1-3	12	2	8.67	52.9	A.
The season	44	0	28.4	10,100	

Monthly discharge of Union Canal Co. canals near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	64	10	36.3	2,160	B.
May	76	54	66.8	4,110	B.
June	76	64	71.4	4,250	B.
July	84	43	75.4	4,640	B.
August	85	35	72.6	4,460	B.
September	54	30	44.5	2,650	B.
October	43	1.0	9.29	571	B.
The season	85	1.0	53.7	22,800	

NORTH YAKIMA POWER WASTE AT NORTH YAKIMA, WASH.

This station is located on the wasteway of the North Yakima power canal below the last diversion—the Milling Co. canal. It represents a direct contribution of the Naches Valley to the Yakima River and is of value in determining the run-off of the Naches Valley.

The station is located in sec. 18, T. 13 N., R. 19 E., between Third and Fourth streets in North Yakima. It was established on July 1, 1909, by the United States Reclamation Service and has been maintained continuously ever since. The staff gage is fastened to the alley bridge, from which measurements are made.

Conditions are good and the channel is unaffected by growth of weeds. The data are good.

Discharge measurements of North Yakima Power waste at North Yakima, Wash., in 1909–10.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1909.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 12[a]	Gleason and Ray	.....	17.4	0.97	63.2
Aug. 5	R. K. Ray	.....	5.3	0.28	5.6
5[a]	.....do	.....	.....	.77	47
1910.					
Mar. 15	H. Kimble	16	23.4	1.44	108
Apr. 6	.....do	16	23.5	1.4	95
May 6	.....do	16	22	1.3	79.3
July 14	.....do	16	18.7	1.15	61.3
Oct. 15	F. F. Henshaw	16	22.4	1.24	66.8
Nov. 22	H. Kimble	16	30.2	1.72	143

[a] These measurements are doubtful and have not been used.

Daily gage height, in feet, and discharge, in second-feet, of North Yakima Power waste at North Yakima, Wash., for 1909.

[A. A. Smith, observer.]

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	0.56	15	1.47	102	.....	74	1.40	92	1.50	106
2	.....	.....	.60	17	1.58	120	.....	71	1.30	78	1.40	92
3	.....	.....	.50	13	1.47	102	.....	68	1.40	92	1.40	92
4	.....	.....	.54	15	1.42	95	1.20	66	1.40	92	1.40	92
5	.....	.....	.54	15	1.04	50	1.30	78	1.40	92	1.30	78
6	.....	.....	.64	19	1.01	47	1.30	78	1.50	106	1.50	106
7	.....	.....	.69	22	.95	42	1.30	78	1.50	106	1.30	78
8	.....	.....	.74	26	.93	40	1.30	78	1.50	106	1.40	92
9	.....	.....	.75	26	.92	39	1.20	66	1.40	92	1.50	106
10	.....	.....	.73	25	.87	35	1.30	78	1.50	106	1.50	106
11	.....	.....	.72	24	.95	42	1.30	78	1.40	92	1.10	55
12	.....	.....	.70	23	.85	34	1.30	78	1.40	92	1.50	106
13	.....	.....	.68	22	.87	35	1.30	78	1.50	106	1.30	78
14	0.83	32	.67	21	.91	38	1.30	78	1.40	92	1.10	55
15	.70	23	.76	27	.89	36	1.30	78	1.30	78	1.40	92
16	.82	31	.79	29	.91	38	1.30	78	1.40	92	1.40	92
17	.56	15	.80	30	.92	39	1.30	78	1.30	78	1.30	78
18	.....	14	.72	24	1.08	53	1.30	78	1.40	92	1.30	78
19	.48	12	.74	26	.99	45	1.30	78	1.50	106	1.30	78
20	.45	11	.79	29	1.04	50	1.30	78	1.40	92	1.00	46
21	.50	13	.76	27	1.24	71	1.30	78	1.50	106	.70	23
22	.70	23	.....	22	1.13	58	1.30	78	1.50	106	1.20	66
23	.60	17	.57	16	1.23	70	1.20	66	1.80	159	.60	17
24	.65	20	.81	31	1.11	56	1.30	78	1.60	123	.70	23
25	.55	15	.86	34	1.21	67	1.30	78	1.50	106	1.20	66
26	.75	26	.66	21	1.29	77	.90	37	1.40	92	1.30	78
27	.70	23	1.18	64	1.24	71	.90	37	1.40	92	1.20	66
28	.....	22	1.23	70	1.26	73	1.40	92	1.30	78	1.10	55
29	.65	20	1.39	91	1.34	84	1.30	78	1.40	92	1.50	106
30	.....	19	1.41	93	1.29	77	1.30	78	1.40	92	1.70	140
31	.61	18	1.47	102	.....	.....	1.30	78	.....	.....	1.70	140

NOTE.—Daily discharge determined from a rating curve fairly well defined for all periods except July, for which it is very uncertain, as the measurements plot erratically.

Daily gage height, in feet, of North Yakima Power waste at North Yakima, Wash., for 1910.

[A. A. Smith, observer.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	1.4	1.5	1.4	0.9	1.3	1.1	1.2	1.1	1.6	1.4	1.3
2	.7	1.4	1.5	1.4	.9	1.2	1.1	1.2	1.1	1.6	1.4	1.4
3	.7	1.3	1.5	1.4	.9	1.0	1.2	1.2	1.1	1.6	1.3	1.3
4	.6	1.3	1.4	1.4	1.0	1.1	1.3	1.2	1.4	1.5	1.4	1.7
5	.6	1.3	1.4	1.5	1.3	1.3	1.2	1.2	1.4	1.5	1.5	1.3
6	.6	1.5	1.4	1.4	1.3	1.3	1.2	1.1	1.2	1.6	1.5	1.2
7	1.0	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.3	1.5	1.5	1.5
8	1.0	1.4	1.4	1.5	1.3	1.1	1.2	1.1	1.3	1.5	1.5	1.5
9	1.0	1.4	1.4	1.5	1.3	1.1	1.1	1.2	1.2	1.5	1.5	1.5
10	1.0	1.4	1.4	1.5	1.4	1.0	1.6	1.2	1.2	1.5	1.5	1.5
11	1.4	1.4	1.5	1.5	1.3	1.2	1.0	1.2	1.2	1.5	1.4	1.5
12	1.5	1.4	1.4	1.5	1.3	1.3	1.1	1.2	1.3	1.5	1.5	1.5
13	1.5	1.4	1.5	1.5	1.3	1.3	.9	1.1	1.4	1.4	1.4	1.5
14	1.5	1.3	1.5	1.3	1.3	1.3	1.1	1.2	1.2	1.3	1.4	1.5
15	1.5	1.3	1.4	1.4	1.2	1.3	1.1	1.1	1.3	1.1	1.5	1.5
16	1.4	1.3	1.4	1.3	1.0	1.3	.9	1.2	1.3	1.3	1.4	1.5
17	1.3	1.4	1.4	1.3	1.1	1.2	1.0	1.3	1.2	1.2	1.5	1.5
18	1.7	1.4	1.4	1.4	1.2	.9	1.0	1.2	1.4	1.5	1.8	1.5
19	1.7	1.4	1.4	1.3	1.3	1.3	.8	1.1	1.4	1.5	1.8	1.5
20	1.6	1.5	1.5	1.2	1.2	1.5	.9	1.1	1.4	1.4	1.9	1.5
21	1.7	1.3	1.5	1.1	1.2	1.3	1.0	1.3	1.4	1.2	1.8	1.5
22	1.4	1.4	1.5	1.0	1.2	1.0	1.1	1.1	1.5	1.2	1.7	1.6
23	1.3	1.5	1.5	1.0	1.2	1.0	1.1	1.1	1.5	1.1	1.7	1.6
24	1.3	1.5	1.4	1.0	1.2	1.1	1.1	1.2	1.6	.8	1.7	1.5
25	1.3	1.5	1.4	.9	1.2	1.2	1.1	1.2	1.5	1.5	1.7	1.7
26	1.3	1.5	1.5	1.1	1.2	1.3	1.0	1.1	1.6	1.5	1.6	1.7
27	1.3	1.4	1.3	1.0	1.2	1.2	1.6	1.1	1.6	1.4	1.5	1.5
28	1.4	1.3	1.5	1.0	1.2	1.2	1.6	1.1	1.6	1.4	1.4	1.5
29	1.3	.....	1.4	1.0	1.1	1.2	1.1	1.1	1.6	1.4	1.4	1.5
30	Dry.	.....	1.4	1.0	1.3	1.1	1.3	1.1	1.6	1.4	1.4	1.6
31	1.3	.....	1.4	.....	1.4	.....	1.4	.9	.....	1.4	.....	1.5

Daily discharge, in second-feet, of North Yakima Power waste at North Yakima, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
1	140	92	106	92	37	78	55	66	55	123	92	78
2	23	92	106	92	37	66	55	66	55	123	92	92
3	23	78	106	92	37	46	66	66	55	123	78	78
4	17	78	92	92	46	55	78	66	92	106	92	140
5	17	78	92	106	78	78	66	66	92	106	106	78
6	17	106	92	92	78	78	66	55	66	123	106	66
7	46	106	92	92	78	66	66	55	78	106	106	106
8	46	92	92	106	78	55	66	55	78	106	106	106
9	46	92	92	106	78	55	55	66	66	106	106	106
10	46	92	92	106	92	46	123	66	66	106	106	106
11	92	92	106	106	78	66	46	66	66	106	92	106
12	106	92	92	106	78	78	55	66	78	106	106	106
13	106	92	106	106	78	78	37	55	92	92	92	106
14	106	78	106	78	78	78	55	66	66	78	92	106
15	106	78	92	92	66	78	55	55	78	55	106	106
16	92	78	92	78	46	78	37	66	78	78	92	106
17	78	92	92	78	55	66	46	78	66	66	106	106
18	140	92	92	92	66	37	46	66	92	106	159	106
19	140	92	92	78	78	78	30	55	92	106	159	106
20	123	106	106	66	66	106	37	55	92	92	178	106
21	140	78	106	55	66	78	46	78	92	66	159	106
22	92	92	106	46	66	46	55	55	106	66	140	123
23	78	106	106	46	66	46	55	55	106	55	140	123
24	78	106	92	46	66	55	55	66	123	30	140	106
25	78	106	92	37	66	66	55	66	106	106	140	140
26	78	106	106	55	66	78	46	55	123	106	123	140
27	78	92	78	46	66	66	123	55	123	92	106	106
28	92	78	106	46	66	66	123	55	123	92	92	106
29	78	.....	92	46	55	66	55	55	123	92	92	106
30	0	.....	92	46	78	55	78	55	123	92	92	123
31	78	.....	92	.....	92	.....	92	37	.....	92	.....	106

NOTE.—Daily discharge for 1910 determined from a fairly well defined rating curve.

Monthly discharge of North Yakima Power waste at North Yakima, Wash., for 1909–10.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1909.					
July 14–31	32	11	19.7	703	C.
August	102	13	32.9	2,020	B.
September	120	34	59.9	3,560	B.
October	92	37	74.0	4,550	B.
November	159	78	97.6	5,810	B.
December	140	17	80.2	4,930	B.
The period	159	11	63.5	21,600	
1910.					
January	140	0	76.8	4,720	B.
February	106	78	91.5	5,080	B.
March	106	78	97.0	5,960	B.
April	106	37	77.5	4,610	B.
May	92	37	67.1	4,130	B.
June	106	37	66.3	3,950	B.
July	123	30	62.0	3,810	B.
August	78	37	60.9	3,740	B.
September	123	55	88.4	5,260	B.
October	123	30	93.6	5,760	B.
November	178	78	113	6,720	B.
December	140	66	106	6,520	B.
The year	178	0	83.3	60,300	

NORTH YAKIMA MILLING CO. WASTE AT NORTH YAKIMA, WASH.

This canal diverts from the North Yakima Power canal wasteway, in sec. 13, T. 13 N., R. 18 E., at the point where the wasteway crosses Sixth Avenue. The canal runs eastward, is used for power development by the North Yakima Milling Co.'s flour mill, and wastes into Yakima River. The station is located below the diversion of the Naches Avenue Union canal and represents a direct contribution from the Naches Valley to the Yakima River and is of value in determining the run-off of that valley.

The station was established July 1, 1909, by the United States Reclamation Service and has been maintained continuously since then. The gage is a staff at the alley bridge between Seventh and Eighth Streets. Discharge measurements are made from the bridge.

A permanent rating curve has been developed. The accuracy of results during 1910 has, however, been diminished by backwater caused by growth of weeds in the channel.

Discharge measurements of North Yakima Milling Co. waste at North Yakima, Wash., in 1909–10.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1909.					
June 12	Gleason and Ray	.....	25.9	1.34	53.2
July 9	R. K. Ray	.....	8.3	0.21	12.1
12	Gleason and Ray	.....	19.9	1.31	41.6
Aug. 5	R. K. Ray	.....	6.5	0.12	7.2
6	Gleason and Ray	.....	18.3	0.98	37.4
19	R. K. Ray	.....	20.9	1.16	42.7
Nov. 20	Kimble and Gleason	.....	29.1	1.74	73.7
1910.					
Apr. 6	H. Kimble	12	28.2	1.8	75
May 6	.....do	12	22.1	1.38	52.2
July 14	.....do	12	21.8	1.3	44.2
Sept. 12	.....do	12	30.9	2.1	69.2
Oct. 15	F. F. Henshaw	14.5	39.9	1.99	76

Daily gage height, in feet, and discharge, in second-feet, of North Yakima Milling Co. waste at North Yakima, Wash., for 1909.

[Harry Tobin, observer.]

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.30	49	1.11	40	1.29	49	.....	62	1.80	75	1.80	75
2	1.30	49	1.19	44	1.45	56	.....	66	1.75	72	1.75	72
3	1.30	49	1.13	41	1.45	56	.....	70	1.75	72	1.70	69
4	1.30	49	1.08	39	1.35	52	1.80	75	1.70	69	1.70	69
5	1.23	46	1.15	42	1.42	55	1.90	81	1.75	72	1.70	69
6	.....	48	1.19	44	1.40	54	1.90	81	1.75	72	1.80	75
7	1.30	49	1.17	43	1.32	50	1.85	78	1.75	72	1.90	81
8	1.05	38	1.18	44	1.31	50	1.80	75	1.80	75	1.60	64
9	.38	16	1.27	48	1.30	49	1.80	75	1.80	75	1.65	66
10	1.35	52	1.20	44	1.26	47	1.60	64	1.70	69	1.80	75
11	1.40	54	1.19	44	1.38	53	1.80	75	1.70	69	1.95	84
12	1.30	49	1.15	42	1.40	54	1.85	78	1.65	66	1.65	66
13	1.25	47	1.11	40	1.45	56	1.90	81	1.70	69	1.60	64
14	1.20	44	1.11	40	1.47	58	1.85	78	1.70	69	1.75	72
15	1.12	41	1.26	47	1.36	52	1.90	81	1.65	66	1.80	75
16	1.02	37	1.20	44	1.40	54	1.85	78	1.70	69	1.70	69
17	1.10	40	1.20	44	1.42	55	1.60	64	1.75	72	1.80	75
18	.....	34	1.12	41	1.48	58	1.60	64	1.75	72	1.75	72
19	.80	28	1.15	42	1.39	54	1.60	64	1.60	64	1.75	72
20	1.30	49	1.20	44	1.42	55	1.60	64	1.80	75	1.70	69
21	1.25	47	1.17	43	1.56	62	1.70	69	1.75	72	1.65	66
22	1.32	50	.....	42	1.37	52	1.70	69	1.80	75	.....	0
23	1.20	44	1.10	40	1.36	52	1.70	69	1.90	81	.....	0
24	1.24	46	1.17	43	1.31	50	1.70	69	1.90	81	.....	0
25	1.25	47	1.31	50	1.36	52	1.60	64	1.70	69	.....	0
26	1.35	52	1.27	48	1.39	54	1.60	64	1.65	66	.....	0
27	1.20	44	1.34	51	1.42	55	1.60	64	1.70	69	.....	0
28	.....	41	1.25	47	1.49	58	1.75	72	1.70	69	.....	0
29	1.05	38	1.15	42	1.51	60	1.70	69	1.70	69	.....	0
30	.....	40	1.20	44	1.49	58	1.75	72	1.85	78	1.80	75
31	1.12	41	1.29	49	.....	.....	1.70	69	.....	.....	2.10	93

NOTE.—Daily discharge determined for 1909 from a fairly well defined rating curve.

Daily gage height, in feet, of North Yakima Milling Co. waste at North Yakima, Wash., for 1910.

[Harry Tobin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.6	1.75	1.7	1.9	1.3	1.4	1.4	0.9	1.7	1.8	1.8	1.2
2	.....	1.7	1.8	1.85	1.3	1.4	1.4	1.1	1.7	1.8	1.8	1.2
3	.....	1.6	1.85	1.7	1.4	1.5	1.3	1.2	1.8	1.8	1.8	1.3
4	.....	1.7	1.8	1.8	1.35	1.45	1.3	.9	1.2	1.9	1.8	1.3
5	.....	1.65	1.95	1.9	1.3	1.5	1.3	.6	1.4	1.9	1.9	1.3
6	.....	1.7	1.9	1.8	1.3	1.5	1.3	.7	1.4	1.9	1.9	1.3
7	.....	1.75	1.8	1.95	1.5	1.5	1.4	.8	1.6	1.8	2.0	1.3
8	.....	1.8	1.95	2.0	1.2	1.4	1.4	1.4	1.8	1.8	1.9	1.3
9	.....	1.75	1.8	1.6	1.0	1.5	1.4	1.3	1.8	1.9	1.9	1.4
10	.....	1.7	1.85	1.75	1.1	1.5	1.0	1.3	1.9	2.0	1.9	1.4
11	.9	1.75	1.7	1.85	1.2	1.7	1.4	1.3	1.8	1.9	2.0	1.4
12	1.0	1.8	1.8	1.6	1.1	1.6	1.3	1.4	2.1	1.9	2.0	1.4
13	.....	1.8	1.75	1.65	1.2	1.6	1.3	1.3	1.9	1.8	1.9	1.4
14	1.1	1.7	1.8	1.65	1.3	1.5	1.35	1.4	1.9	1.8	1.9	1.4
15	.....	1.6	1.75	1.6	1.2	1.5	1.4	1.5	1.9	1.8	1.9	1.4
16	.....	1.7	1.8	1.6	.95	1.5	1.5	1.4	1.9	1.8	1.9	1.4
17	.05	1.6	1.8	1.6	1.0	1.5	1.5	1.4	1.8	1.8	1.6	1.45
18	.85	1.7	1.75	1.65	1.15	1.3	1.3	1.4	1.8	1.9	.....	1.4
19	1.0	1.8	1.85	1.3	1.3	1.6	1.0	1.4	1.8	1.8	.....	1.6
20	1.7	1.85	1.8	1.3	1.2	1.3	1.5	1.4	1.8	1.7	.....	1.6
21	1.65	1.75	1.7	1.6	1.2	1.3	1.4	1.4	1.9	1.7	.....	1.7
22	1.4	1.8	1.65	1.2	1.4	1.3	1.5	1.4	1.9	1.9	.....	1.7
23	1.5	1.65	1.8	1.2	1.3	1.3	1.5	1.4	1.8	1.9	.....	1.7
24	1.7	1.7	1.75	1.2	1.4	1.5	1.4	1.4	1.8	1.9	.....	1.7
25	1.8	1.75	1.85	1.3	1.4	1.5	1.4	1.4	1.8	1.9	.7	.....
26	1.7	1.7	1.8	1.4	1.4	1.4	1.4	1.4	1.8	1.8	.6	.....
27	1.7	1.8	1.75	1.25	1.4	1.4	.1	1.4	1.8	1.8	.5	1.8
28	1.75	1.85	1.85	1.2	1.4	1.4	.....	1.7	1.8	1.8	.5	1.8
29	1.8	.....	1.85	1.2	1.4	1.4	.1	1.7	1.8	1.8	1.1	1.7
30	1.75	.....	1.85	1.2	1.4	1.4	.8	1.7	1.8	1.8	1.1	1.75
31	1.7	.....	1.85	.....	1.4	.....	.9	1.7	.....	1.8	.....	1.8

Daily discharge, in second-feet, of North Yakima Milling Co. waste at North Yakima, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	64	72	69	81	49	54	54	22	49	59	75	44
2	0	69	75	78	49	54	54	28	49	59	75	44
3	0	64	78	69	54	59	49	32	54	59	75	49
4	0	69	75	75	52	56	49	22	28	64	75	49
5	0	66	84	81	49	59	49	14	36	64	81	49
6	0	69	81	75	49	59	44	16	36	64	81	49
7	0	72	75	84	59	59	49	19	44	64	87	49
8	0	75	84	87	44	54	49	36	54	64	81	49
9	0	72	75	64	36	59	49	32	54	69	81	54
10	0	69	78	72	40	59	32	32	59	75	81	54
11	32	72	69	78	44	69	49	32	54	69	87	54
12	36	75	75	64	40	64	44	36	69	69	87	54
13	0	75	72	66	44	64	44	32	59	64	81	54
14	40	69	75	66	49	59	47	36	59	64	81	54
15	0	64	72	64	44	59	44	40	59	64	81	54
16	0	69	75	64	34	59	49	36	59	64	81	54
17	10	64	75	64	36	59	49	36	54	64	64	56
18	30	69	72	66	42	49	40	36	54	69	0	54
19	36	75	78	49	49	64	28	36	54	69	0	64
20	69	78	75	49	44	49	49	36	54	64	0	64
21	66	72	69	64	44	49	44	36	59	64	0	69
22	54	75	66	44	54	49	49	36	64	75	0	69
23	59	66	75	44	49	49	49	36	59	75	0	69
24	69	69	72	44	54	59	44	36	59	75	0	69
25	75	72	78	49	54	59	44	36	59	75	25	0
26	69	69	75	54	54	54	40	36	59	75	22	0
27	69	75	72	47	54	54	0	36	59	75	19	75
28	72	78	78	44	54	54	0	49	59	69	19	75
29	75	.....	78	44	54	54	0	19	59	75	40	69
30	72	.....	78	44	54	54	19	49	59	75	40	72
31	69	.....	78	.....	54	.....	22	49	.....	75	.....	75

NOTE.—Daily discharge for 1910 determined from a fairly well defined rating curve, except July 2 to November 1, 1910, for which period it has been necessary to make corrections to eliminate effect of backwater caused by growth of weeds.

Monthly discharge of North Yakima Milling Co. waste at North Yakima, Wash., for 1909–10.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1909.					
July	54	16	43.8	2,690	C.
August	51	40	43.7	2,690	C.
September	62	47	54.0	3,210	C.
October	81	62	71.1	4,370	B.
November	81	64	71.4	4,250	B.
December	93	0	53.8	3,310	B.
The period	93	0	56.2	20,500	
1910.					
January	75	0	34.4	2,120	B.
February	78	64	70.8	3,930	B.
March	84	66	75.2	4,620	B
April	87	44	62.5	3,720	B.
May	54	33	47.9	2,950	B.
June	69	49	56.9	3,370	B.
July	54	0	37.7	2,320	B.
August	49	14	34.1	2,100	B.
September	69	28	54.4	3,240	B.
October	75	59	68.0	4,180	B.
November	87	0	50.6	3,010	B.
December	75	0	54.6	3,360	B.
The year	87	0	53.9	38,900	

CANALS TAKING WATER FROM TIETON RIVER.

TIETON CANAL NEAR NACHES, WASH.

The Tieton canal diverts water from the right bank of Tieton River 21 miles above Naches. It is owned and operated by the United States Reclamation Service. The canal follows the Tieton Canyon for miles in a concrete flume, and after tunneling through a hill irrigates land in the Cowiche Valley. When completed the Tieton canal will irrigate land in the Cowiche Valley, Wide Hollow, and hills south of Naches. In 1910 1,695 acres were under irrigation.

The measurements were made in a straight earth section, where conditions are excellent. A float gage is located in a stilling box in the side of the canal. The zero of the gage is at elevation 2,294.82 feet, United States Reclamation Service datum.

The records for 1910 were supplied by the United States Reclamation Service and are excellent.

Discharge measurements of Tieton canal near Naches, Wash., in 1909–10.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1909.		*Feet.*	*Sq. feet.*	*Feet.*	*Sec.-ft.*
July 4	Gleason and Ray		96.3	4.22	271
1910.					
May 10	C. F. Gleason		10.6	0.65	11.9
10	do		17.4	1.91	29.9
10	do		27	1.51	59.1
10	do		38.5	2.05	96.8
June 9	Gleason and Ray		18.4	1.05	30.8
9	do		28.5	1.58	66.4
9	do		43.6	2.24	114
July 1	C. F. Gleason		67.2	3.16	182
26	Gleason and Ray		23.9	1.33	46.5
Aug. 6	C. F. Gleason		22.7	1.29	43.2
23	do		28.1	1.52	60.9
23	do		17.9	1.01	28.6

Daily gage height, in feet, and discharge, in second-feet, of Tieton canal near Naches, Wash., for 1910.

[Clarence Clements, observer.]

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	0.65	12.1	1.30	45.0	1.11	34.0	1.38	50.3
2	.65	12.1	1.30	45.0	1.11	34.0	1.38	50.3
3	.65	12.1	1.30	45.0	1.11	34.0	1.38	50.3
4	.65	12.1	1.30	45.0	1.11	34.0	1.30	45.0
5	.65	12.1	1.30	45.0	1.11	34.0	1.30	45.0
6	.65	12.1	1.30	45.0	1.11	34.0	1.30	45.0
7	.65	12.1	1.30	45.0	1.14	35.7	1.20	39.1
8	.65	12.1	1.30	45.0	1.19	38.5	1.20	39.1
9	.65	12.1	1.30	45.0	1.19	38.5	1.10	33.5
10	.65	12.1	1.35	48.3	1.19	38.5	1.10	33.5
11	.65	12.1	1.35	48.3	1.19	38.5	1.10	33.5
12	.65	12.1	1.35	48.3	1.19	38.5	.84	20.2
13	.68	13.3	1.35	48.3	1.24	41.5	.84	20.2
14	.91	23.5	1.35	48.3	1.24	41.5	.84	20.2
15	1.04	30.3	1.35	48.3	1.24	41.5	.84	20.2
16	1.10	33.5	1.35	48.3	1.24	41.5		
17	1.10	33.5	1.35	48.3	1.24	41.5		
18	1.10	33.5	1.35	48.3	1.24	41.5		
19	1.10	33.5	1.35	48.3	1.24	41.5		
20	1.10	33.5	1.35	48.3	1.24	41.5		
21	1.10	33.5	1.30	45.0	1.24	41.5		
22	1.20	39.1	1.28	43.8	1.24	41.5		
23	1.20	39.1	1.17	37.4	1.24	41.5		
24	1.24	41.5	1.10	33.5	1.28	43.8		
25	1.30	45.0	1.10	33.5	1.28	43.8		
26	1.30	45.0	1.05	30.8	1.33	47.0		
27	1.30	45.0	1.05	30.8	1.33	47.0		
28	1.30	45.0	1.00	28.2	1.33	47.0		
29	1.30	45.0	1.05	30.8	1.38	50.3		
30	1.30	45.0	1.11	34.0	1.38	50.3		
31	1.30	45.0			1.38	50.3		

Monthly discharge of Tieton canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
May	45.0	12.1	27.3	1,696
June	48.3	28.2	42.8	2,568
July	50.3	34.0	40.9	2,536
Aug. 1-15	50.3	20.2	36.4	1,091
The season	50.3	12.1	36.9	7,891

MINOR PRIVATE CANALS.

Tables showing the discharge of the minor private canals in Yakima Valley follow:

Discharge measurements of Olson canal near Ellensburg, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 13	H. Kimble		7.4	1.80	17.2
June 11	do		11.7	2.20	41.9
23	do		10.2	2.02	31.0
Aug. 5	do		20.5	2.50	83.2

Monthly discharge of Olson canal near Ellensburg, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
May 15-31	65	14	22.8	768
June	65	14	39.4	2,340
July	65	7.0	19.1	1,170
August	123	65	95.5	5,879
September	83	14	39.9	2,370
Oct. 1-4	23	14	17.2	137
The period	123	7.0	44.7	12,700

Discharge measurements of Taylor canal at Selah, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 16	H. Kimble		8.3	1.08	10.7
30	do		12.8	1.60	14.7
May 25	do		21.5	2.52	28.6
June 21	do		13.4	1.65	13.9
29	J. E. Forman		18.6	2.25	22.3
July 19	H. Kimble		13.0	1.70	13.6
Sept. 13	H. D. McGlashan		11.4	1.52	10.4
19	H. Kimble		4.8	.80	1.5

Monthly discharge of Taylor canal at Selah, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
Apr. 10-30	22	9.5	13.2	550
May	28	15	24.5	1,510
June	28	7.9	17.8	1,060
July	20	11	15.5	953
August	19	16	17.8	1,090
September	17	1.4	6.37	379
October	12	1.4	7.19	442
The season	28	1.4	14.7	5,980

Discharge measurements of Upper Scott canal near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 4	H. Kimble	8	3.77	0.78	3.71
20	Kimble and Ebert	8	8.5	1.4	12.7
July 6	H. Kimble	8	8.3	1.4	11.7

Monthly discharge of Upper Scott canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
Apr. 26-30	5	3.0	3.80	38
May	18	0	11.7	719
June	18	0	13.2	786
July	19	4.0	13.3	818
August	19	0	13.6	836
September	15	0	8.57	510
Oct. 1-12	13	0.9	7.26	173
The season	19	0	11.4	3,880

Discharge measurements of Lowery canal near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	H. Kimble	.....	3.62	1.00	2.81
May 20	.....do	.....	5.52	1.10	7.14
July 11	.....do	.....	7.2	1.30	6.89
Sept. 13	.....do	.....	7.2	1.30	3.27

Monthly discharge of Lowery canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
Apr. 20-30	9.6	0.9	4.77	104
May	11	4.5	8.04	494
June	12	5.6	8.19	487
July	6.6	3.4	5.38	331
August	6.2	3.4	5.05	311
September	6.7	4.4	5.71	340
October	4.5	1.5	2.22	136
The season	12	0.9	5.70	2,200

Discharge measurements of Kelly canal near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 31	H. Kimble	.....	1.3	0.37	0.45
Apr. 20	.....do	.....	7.0	1.20	15.4
May 20	.....do	.....	6.1	1.10	12.6
July 11	.....do	.....	6.8	1.18	14.7

Monthly discharge of Kelly canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
Apr. 20-30	24	13	19.0	415
May	15	6.0	12.4	762
June	15	6.0	10.2	607
July	24	9.1	14.1	867
Aug. 1-27	15	7.0	10.6	568
The period	24	6.0	12.5	3,220

Discharge measurements of Fortune canal near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	H. Kimble	5.8	6.67	1.00	15.1
May 4	.....do	5.8	4.6	.67	8.3
May 20	Kimble and Ebert	5.8	7.5	1.2	17.1
July 6	H. Kimble	5.8	7.0	1.06	14.2

Monthly discharge of Fortune canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
Apr. 8-30	21	1.0	9.73	444
May	24	5.9	18.1	1,110
June	21	.07	17.2	1,020
July	23	4.5	16.7	1,030
August	24	4.5	17.4	1,070
September	21	4.5	11.1	660
October	19	1.0	3.22	198
The season	24	.07	13.5	5,530

Discharge measurements of Lower Scott canal near Naches, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 30	H. Kimble	9.0	4.2	0.68	3.3
Apr. 2	do	9.2	12.2	1.48	16.0
May 4	do	9.2	4.52	.68	3.4
20	do	9.6	12.9	1.40	15.6
July 6	do	9.7	10.4	1.18	8.1

Monthly discharge of Lower Scott canal near Naches, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	19	1.1	7.57	450
May	21	1.7	14.9	916
June	21	2.3	13.9	827
July	16	2.4	10.4	640
August	17	1.0	10.7	658
September	16	3.9	8.68	516
October	16	3.9	10.3	633
The season	21	1.0	10.9	4,640

Discharge measurements of Fruitvale Schanno canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 18	H. Kimble	10	8.01	0.78	13.5
May 5	do	10	9.2	.88	17.1
July 14	do	10	9.5	.9	20.3
Sept. 14	do	10	6.95	.65	8.81

Monthly discharge of Fruitvale Schanno canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	18	0.0	8.71	518
May	18	14	16.0	984
June	18	.0	15.9	946
July	18	8.0	17.2	1,060
August	21	14	17.0	1,050
September	18	2.8	10.7	637
October	4.8	.0	2.89	178
The season	21	.0	12.6	5,370

Discharge measurements of R. S. & C. canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 6	H. Kimble	4.2	1.2	0.26	1.03
18	do	4.2	2.3	.52	4.00
May 5	do	4.2	2.95	.68	7.74
July 14	do	4.2	3.78	.90	10.5
25	do	4.2	3.23	.70	8.4
28	do	4.2	3.72	82	7.91
Sept. 14	do	4.2	3.31	.70	5.25

Monthly discharge of R. S. & C. canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
Apr. 6–30	7.3	1.1	4.33	215
May	8.3	5.4	7.12	438
June	11	3.7	7.39	440
July	12	7.2	9.61	591
August	10	3.7	7.34	451
September	10	.0	4.92	293
Oct. 1–18	1.4	.5	1.25	44.6
The season	12	.0	6.36	2,470

Discharge measurements of Broadgage canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 6	H. Kimble	5.7	4.69	0.92	9.7
18	do	5.7	5.08	.98	11.1
May 5	do	5.7	5.46	1.03	11.5
July 14	do	5.7	5.02	.99	9.7
Sept. 14	do	5.7	3.34	.77	3.77

Monthly discharge of Broadgage canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
Apr. 6-30	11	0.0	5.43	269
May	12	1.9	10.5	646
June	12	6.5	9.74	580
July	13	3.5	9.66	594
August	13	9.6	10.7	658
Sept. 1-23	12	.0	3.63	166
The season	13	.0	8.58	2,910

Discharge measurements of North Yakima Town canal near North Yakima, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 18	H. Kimble	.....	5.71	0.85	5.9
May 5	.....do	.....	4.78	.75	3.95
Sept. 14	.....do	.....	11.4	1.95	9.77

Monthly discharge of North Yakima Town canal near North Yakima, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	10	2.7	5.69	339
May	8.5	3.3	5.58	343
June	7.5	1.4	5.31	316
July	5.9	1.4	3.99	245
August	10	5.0	7.52	462
September	11	.0	7.33	436
October	5.9	.0	2.31	142
The season	11	.0	5.38	2,280

Summary of monthly run-off, in acre-feet, of canals in Yakima Valley for 1910.

Diversions from Yakima River.

Canal.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Total period.
KITTITAS VALLEY.								
Cascade	.....	2,080	4,020	5,280	5,110	4,400	365	21,300
Olson	.....	768	2,340	1,170	5,870	2,370	137	12,700
Ellensburg Water Co	63.5	7,010	8,210	7,260	8,300	4,750	1,680	37,300
West Kittitas	.....	3,860	3,030	6,210	6,700	3,230	506	23,500
Bull [a]	1,010	1,910	1,840	2,030	2,090	1,610	1,040	11,500
Fogarty [a]	1,070	1,110	1,010	676	307	238	123	4,530
Total	2,140	16,700	20,400	22,600	28,400	16,600	3,850	111,000
YAKIMA-MOXEE VALLEY.								
Selah-Moxee	1,880	3,880	3,910	4,410	4,240	3,400	2,240	24,000
Taylor	550	1,510	1,060	953	1,090	379	442	5,980
Moxee Co. [b]	689	2,450	1,940	1,950	1,540	923	558	10,000
Granger [a]	298	492	476	492	553	119	61	2,490
Fowler	1,330	3,420	3,070	3,140	3,170	1,800	507	16,400
Total	4,750	11,800	10,500	10,900	10,600	6,620	3,810	58,900

[a] Estimated. [b] Sum of Moxee and Hubbard canals.

Summary of monthly run-off, in acre-feet, of canals in Yakima Valley for 1910—Contd.

Diversions from Yakima River—Continued.

Canal.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Total period.
INDIAN RESERVATION BASIN.								
New Reservation	14,900	21,300	17,600	17,000	7,870	6,130	9,780	94,600
Old Reservation	9,640	15,200	12,600	9,220	4,980	3,730	5,960	61,300
Sunnyside	34,800	38,900	41,800	44,200	39,500	37,600	38,600	275,000
Total	59,300	75,400	72,000	70,400	52,400	47,500	54,300	431,000
LOWER YAKIMA VALLEY.								
Kiona	649	1,360	1,580	1,480	1,520	1,240	1,030	8,860
Kennewick	6,960	11,300	12,000	12,500	11,600	9,640	7,750	71,800
Lower Yakima	.....	4,220	7,080	8,610	7,620	6,550	5,120	39,200
Amon [a]	893	1,660	1,670	1,780	1,840	1,430	922	10,200
Total	8,490	18,500	22,300	24,400	22,600	18,900	14,800	130,000
Total Yakima River	74,700	122,000	125,000	128,000	114,000	89,600	76,800	731,000

Diversions from Naches River.

ABOVE TIETON RIVER.								
Selah Valley	1,580	6,150	6,600	7,070	7,560	6,720	4,100	39,800
BETWEEN TIETON RIVER AND COWICHE CREEK.								
Wapatox [a]	1,350	2,490	3,320	4,130	3,740	3,940	4,080	23,000
Clarke [b]	893	861	714	676	492	357	246	4,240
John Cox [b]	119	123	119	123	123	119	61	787
Upper Scott	38	719	786	818	836	510	173	3,880
Lowery [b]	104	494	487	331	311	340	136	2,200
Kelly [b]	415	762	607	867	568	.....	.....	3,220
Fortune	444	1,110	1,020	1,030	1,070	660	198	5,530
Lower Scott	450	916	827	640	658	516	633	4,640
Basket Ford [b]	119	246	238	246	246	179	123	1,400
Naches Canal Co. (Gleed)	2,380	4,480	3,490	3,780	3,190	1,760	.....	19,100
Congdon (Yakima Valley)	674	2,560	2,840	3,220	2,880	.....	.....	12,200
McCormack & Long [b]	238	430	417	492	492	417	241	2,730
Chapman & Nelson [b]	336	984	1,010	1,110	1,110	1,010	553	6,110
Sculler & Rodenbach [b]	119	184	238	246	246	179	123	1,340
Total	7,680	16,400	16,100	17,700	16,000	9,990	6,570	90,400
BELOW COWICHE CREEK.								
Naches-Cowiche	599	1,890	1,960	2,350	1,580	1,140	413	9,930
Fruitvale Schanno	518	984	946	1,060	1,050	637	178	5,370
R. S. & C	215	438	440	591	451	293	44.6	2,470
Schanno	972	1,880	1,710	2,130	1,570	898	178	9,340
Broadgage	269	646	580	594	658	166	.....	2,910
Union Canal Co. [c]	2,160	4,110	4,250	4,640	4,460	2,650	571	22,800
North Yakima Town	339	343	316	245	462	436	142	2,280
Total	5,070	10,300	10,200	11,600	10,200	6,220	1,530	55,100
Total Naches River	14,300	32,700	32,900	36,400	33,800	22,900	12,200	185,000

Diversions from Tieton River.

Tieton canal	.....	1,660	2,560	2,520	1,070	.....	.....	7,811
Grand total	89,000	157,000	161,000	167,000	149,000	113,000	89,000	924,000

[a] Difference between Wapatox canal at intake and at power house plus Lower Wapatox Canal.
[b] Estimated.
[c] Sum of Old Union and Naches Avenue Union Canals less estimated return of Old Union.

SNAKE RIVER BASIN.

GENERAL FEATURES.

Snake River, the largest tributary of the Columbia, rises among the high peaks of the Rocky Mountains in Yellowstone National Park, western Wyoming, and eastern Idaho, heading in the divide from which streams flow northward and eastward into the Missouri, southward to the Colorado and the lakes of the Great Basin, and westward to the Columbia. From Shoshone, Lewis, and Hart lakes, in Yellowstone National Park, the South Fork of the river flows southward, broadening into Jackson Lake (4 miles wide and 18 miles long) and passing through Jackson Valley (8 miles wide and 40 miles long), beyond which, near the Idaho-Wyoming line, it enters a long canyon. In the southern part of Fremont County, Idaho, it receives the North Fork. Below the junction of the Forks the Snake flows southward and westward across Idaho to a point near Homedale, near the Oregon-Idaho line, where it turns abruptly northward and forms for about 170 miles the boundary between Idaho and Oregon and for 30 miles more that between Idaho and Washington. At Lewiston it crosses into Washington, flows northwest, west, and southwest, and joins the Columbia near Pasco.

Practically all the important tributaries of Snake River have their sources in the high mountains, which are heavily timbered. The most heavily timbered areas are those at the head of the South Fork in the Yellowstone Park region, the upper areas of Teton, Fall, and North Fork of Snake rivers in eastern Idaho, and those of upper Boise and Payette rivers in central Idaho.

Precipitation in the Snake River drainage area ranges from 6 or 8 inches in the valley to 50 inches at the head of many of the tributaries. In the higher altitudes the precipitation is practically all in the form of snow, but the snowfall in the lower valleys, below American Falls, Idaho, is comparatively light. During the last few years there has been considerable rainfall, and dry farming has been practiced successfully in the valleys in the vicinity of Idaho Falls, Blackfoot, and St. Anthony, Idaho. The temperature in these valleys ranges from 100° in the summer to 35° below zero in the winter; in the Twin Falls and Boise valleys the temperature ranges from approximately 110° in the summer to zero in the winter.

The driest year recorded in the drainage basin was 1905; the wet years were 1896, 1899, 1904, 1907, and 1909.

Snake River basin has many feasible storage sites, but only a very few have been developed. About 400,000 acre-feet can be stored in Jackson Lake by a dam which has been constructed by the United States Reclamation Service. The largest site is at Swan Valley, on the South Fork of Snake, and the water available for storage is

approximately 4,000,000 acre-feet. Reservoir sites are also found on North Fork of Snake, Fall, Teton, Boise, and Payette rivers. Many of these sites will no doubt be used at some future time by the United States Reclamation Service in connection with the Minidoka and Payette-Boise projects.

Irrigation has reached a high stage of development in the Snake River Valley, yet approximately 6,000,000 acre-feet of water annually runs to waste. Eventually these flood waters will be stored and used to irrigate thousands of acres of arid land.

The streams afford enormous water powers, but only a few sites have been developed owing to the lack of market. Large power plants have been installed at Horseshoe Bend on the Payette, at the mouth of the canyon on the Boise, and on Snake River at American Falls, Shoshone Falls, Salmon Falls, and at the Minidoka dam. Many other smaller plants are also in use.

The upper drainage basin of the South Fork comprises the timbered mountainous country west and southwest of Yellowstone Lake. The east side of its valley is bounded by the Wind River Range, from the slopes of which it receives a large number of tributaries, and the west side by the high Teton Mountains. Most of the drainage from Teton Mountains flows westward through Teton River into North Fork.

Below the junction of North and South forks the Snake receives many tributaries, the most important of which are listed in the following table:

Principal tributaries of Snake River.

From the left (going downstream.)	From the right (going downstream.)
Willow Creek.	North (or Henry) Fork Teton River.
Blackfoot River.	Malade (or Big Wood) River.
Portneuf River.	Boise River.
Raft River.	Payette River.
Goose Creek.	Weiser River.
Rock Creek.	Salmon River.
Salmon Falls River.	Clearwater River.
Bruneau River.	Palouse River.
Owyhee River.	
Malheur River.	
Alder Creek.	
Powder River.	
Imnaha River.	
Grande Ronde River.	
Tucannon River.	

SOUTH FORK OF SNAKE RIVER AT MORAN, WYO.

This station, which is located in sec. 17, T. 45 N., R. 114 W., sixth principal meridian, about 1½ miles below the United States Reclamation Service dam and Moran postoffice, which are at the outlet of Jackson Lake, was established September 21, 1903.

No large tributaries enter and no water is diverted between the station and the Jackson Lake reservoir, so that the record shows only the water flowing over the Reclamation Service dam. The principal tributaries below the station are Buffalo, Gros Ventre, John Day, and Salt rivers.

Discharge measurements are made from a car and cable about 150 feet below the inclined staff gage.

The gage heights are not affected by ice or by artificial control below the station, but some irregularity in daily flow is caused by the opening and closing of the gates at the dam above. The gage datum has remained unchanged since the establishment of the station.

The stream bed shifts during floods. The rating curves used for 1910 are well defined, however, and the records may be considered excellent.

Discharge measurements of South Fork of Snake River at Moran, Wyo., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 15	G. C. Baldwin	210	1,280	5.20	5,240
16	do	210	1,250	5.03	4,950
18	do	209	1,170	4.64	4,390
19	do	208	1,139	4.46	4,110
20	do	207	1,100	4.32	3,890
21	do	206	1,070	4.17	3,700
22	do	206	1,040	4.04	3,480
23	do	206	1,010	3.87	3,210
24	do	206	975	3.73	2,980
25	do	206	947	3.59	2,810
26	do	206	926	3.48	2,660
27	do	206	895	3.33	2,460
28	do	206	870	3.21	2,320
29	do	206	850	3.10	2,160
30	do	205	829	3.00	2,020
31	do	205	809	2.93	1,920
Aug. 1	do	205	798	2.86	1,870
2	do	205	777	2.76	1,750
3	do	205	765	2.68	1,670
4	do	204	746	2.59	1,570
5	do	204	736	2.54	1,520
6	do	204	725	2.47	1,460
7	do	204	715	2.42	1,400
8	do	203	694	2.35	1,330
9	do	203	683	2.30	1,280
10	do	203	673	2.24	1,240
11	do	203	664	2.20	1,200
12	do	203	666	2.85	1,190
13	do	203	662	2.16	1,170
14	do	203	656	2.13	1,150
16	do	202	646	2.05	1,100
17	do	202	637	2.01	1,050
18	do	202	627	1.98	1,020
19	do	202	626	1.96	1,010
20	do	202	617	1.94	980
21	do	202	617	1.91	971
22	do	201	606	1.86	925
23	do	200	596	1.81	888
24	do	199	586	1.76	857
25	do	199	576	1.70	808
26	do	199	565	1.68	794
27	do	199	566	1.67	784
28	do	198	563	1.63	759
29	do	198	556	1.60	737
30	do	197	550	1.57	716
31	do	196	549	1.56	706
Sept. 1	do	196	538	1.53	684

Daily gage height, in feet, of South Fork of Snake River at Moran, Wyo., for 1910.

[Mrs. Maria Allen, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.65	1.6	1.65	1.6	4.4	5.0	3.25	2.85	1.54	.....	.....	1.05
2	1.65	1.6	.....	1.6	4.3	5.4	3.25	2.77	1.4	.....	.....	1.05
3	1.65	1.55	1.65	1.6	4.3	5.55	3.20	2.69	1.4	.....	.....	1.05
4	1.65	.....	1.65	1.6	4.35	5.6	3.20	2.60	1.3	.....	.....	1.0
5	.....	1.55	1.7	.....	4.4	5.65	8.50	2.54	1.0	.....	.....	1.0
6	1.65	.....	.....	1.6	4.45	5.65	8.80	2.47	.....	.....	.....	.....
7	.....	1.55	1.6	.....	4.45	5.6	7.58	2.41	.....	.....	.....	.....
8	1.7	.....	.....	1.65	4.45	4.5	7.30	2.35	.....	.....	.....	.....
9	.....	1.55	1.55	1.65	4.55	3.45	7.15	2.30	.....	.....	.....	.....
10	1.7	.....	.....	1.7	4.65	3.25	6.60	2.25	.....	.....	.....	.....
11	.....	1.55	1.55	1.75	4.85	2.3	6.35	2.21	.....	.....	.....	.....
12	.....	1.55	1.55	.....	5.05	2.55	6.15	2.19	.....	.....	.....	1.0
13	1.7	.....	1.55	1.8	5.15	3.15	5.76	2.16	.....	.....	.....	1.15
14	.....	1.5	1.55	1.9	5.5	3.25	5.48	2.14	.....	.....	.....	1.15
15	1.7	.....	.....	1.1	5.5	3.4	5.26	2.12	.....	.....	.....	1.25
16	.....	1.5	1.55	2.0	5.3	3.55	5.03	2.06	.....	.....	.....	1.35
17	1.7	.....	1.55	2.0	4.7	2.15	4.84	2.01	.....	.....	.....	1.5
18	1.7	.....	.....	2.25	4.4	2.25	4.67	1.98	.....	.....	.....	1.55
19	.....	1.5	1.55	2.35	3.2	2.45	4.50	1.95	.....	.....	.....	1.7
20	1.7	.....	1.55	2.45	3.35	2.65	4.33	1.93	.....	.....	.....	1.6
21	.....	1.5	.....	2.65	3.45	2.7	4.18	1.91	.....	.....	.....	1.45
22	1.7	.....	1.55	2.75	3.55	2.75	4.05	1.86	.....	.....	.....	1.3
23	.....	1.5	.....	2.95	3.75	2.85	3.87	1.82	.....	.....	.....	1.2
24	1.7	.....	1.55	3.25	4.05	2.95	3.75	1.76	.....	.....	.....	1.2
25	.....	.....	1.6	3.35	4.2	2.9	3.61	1.71	.....	.....	.....	.....
26	1.7	1.5	1.6	3.55	4.4	2.9	3.48	1.68	.....	.....	.....	.....
27	.....	1.55	1.65	3.75	4.65	3.0	3.34	1.66	.....	.....	.....	.....
28	1.65	1.55	1.65	4.15	4.75	3.1	3.23	1.64	.....	.....	1.0	1.3
29	1.65	.....	.....	4.45	4.9	3.25	3.12	1.62	.....	.....	1.0	.....
30	1.65	.....	1.65	4.75	5.05	3.25	3.02	1.58	.....	.....	1.05	.....
31	1.65	.....	1.65	.....	5.25	.....	2.93	1.56	.....	.....	.....	.....

NOTE.—Gage not read on days during January to April for which no record is given. For days of no record during September to December the water was away from the gage and below a stage of 1 foot. The flow during this period was controlled by construction work at Jackson Lake dam.

Daily discharge, in second-feet, of South Fork of Snake River at Moran, Wyo., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	885	850	885	850	3,840	4,770	2,340	1,860	698	.....	.....	425
2	885	850	885	850	3,700	5,420	2,340	1,770	610	.....	.....	425
3	885	815	885	850	3,700	5,680	2,290	1,680	610	.....	.....	425
4	885	815	885	850	3,770	5,760	2,290	1,580	550	.....	.....	400
5	885	815	920	850	3,840	5,840	11,500	1,520	400	.....	.....	400
6	885	815	885	850	3,920	5,840	12,100	1,450	.....	.....	.....	.....
7	902	815	850	868	3,920	5,760	9,660	1,390	.....	.....	.....	.....
8	920	815	832	885	3,920	3,990	9,100	1,340	.....	.....	.....	.....
9	920	815	815	885	4,060	2,580	8,800	1,290	.....	.....	.....	.....
10	920	815	815	920	4,220	2,340	7,750	1,240	.....	.....	.....	.....
11	920	815	815	955	4,530	1,390	7,280	1,210	.....	.....	.....	.....
12	920	815	815	972	4,850	1,620	6,910	1,190	.....	.....	.....	400
13	920	798	815	990	5,010	2,240	6,210	1,160	.....	.....	.....	475
14	920	780	815	1,070	5,590	2,340	5,730	1,150	.....	.....	.....	475
15	920	780	815	530	5,590	2,520	5,360	1,130	.....	.....	.....	525
16	920	780	815	1,150	5,250	2,700	4,990	1,080	.....	.....	.....	580
17	920	780	815	1,150	4,290	1,270	4,680	1,040	.....	.....	.....	670
18	920	780	815	1,350	3,840	1,350	4,410	1,010	.....	.....	.....	705
19	920	780	815	1,440	2,290	1,520	4,150	990	.....	.....	.....	810
20	920	780	815	1,520	2,460	1,710	3,900	974	.....	.....	.....	740
21	920	780	815	1,710	2,580	1,760	3,670	958	.....	.....	.....	640
22	920	780	815	1,810	2,700	1,810	3,480	922	.....	.....	.....	550
23	920	780	815	2,020	2,960	1,910	3,200	894	.....	.....	.....	500
24	920	780	815	2,340	3,350	2,020	3,030	852	.....	.....	.....	500
25	920	780	850	2,460	3,560	1,960	2,830	817	.....	.....	.....	.....

Daily discharge, in second-feet, of South Fork of Snake River at Moran, Wyo., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	920	780	850	2,700	3,840	1,960	2,650	796	.....	.....	.....	.....
27	909	815	885	2,960	4,220	2,070	2,460	782	.....	.....	.....	.....
28	885	815	885	3,480	4,370	2,180	2,320	768	.....	.....	400	550
29	885	.....	885	3,920	4,610	2,340	2,180	754	.....	.....	400	.....
30	885	.....	885	4,370	4,850	2,340	2,050	726	.....	.....	425	.....
31	885	.....	885	.....	5,170	.....	1,950	712	.....	.....	.....	.....

NOTE.—Daily discharge previous to July 4 determined from a rating curve well defined below 7,400 second-feet; after July 4 from a curve well defined below 5,800 second-feet. Discharge interpolated for days on which gage was not read during January to April. For periods of nonrecorded gage heights during September to December the flow was partly controlled by construction work at Jackson Lake dam. The water was away from the gage and at a stage less than 1 foot during these periods. See note to table of monthly estimates.

Monthly discharge of South Fork of Snake River at Moran, Wyo., for 1910.

[Drainage area, 820 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	920	885	908	1.11	1.28	55,800	A.
February	850	780	801	.977	1.02	44,500	A.
March	920	815	845	1.03	1.19	52,000	A.
April	4,370	850	1,590	1.94	2.16	94,600	A.
May	5,590	2,290	4,030	4.91	5.66	248,000	A.
June	5,840	1,270	2,900	3.54	3.95	173,000	A.
July	12,100	1,950	4,890	5.96	6.87	301,000	A.
August	1,860	712	1,130	1.38	1.59	69,500	A.
September	698	.....	146	.178	.20	8,690	D.
October	.....	.....	60	.073	.08	3,690	D.
November	425	.....	94.8	.115	.13	5,640	D.
December	810	.....	352	.429	.49	21,600	C.
The year	12,100	.....	1,490	1.82	24.62	1,080,000	

NOTE.—Daily discharges estimated at 60 second feet for September 6–November 27, December 6–11, 25–27, and 29–31.

SOUTH FORK OF SNAKE RIVER NEAR LYON, IDAHO.

This station, which is located just below the highway bridge between Conant and Swan Valleys, about 2 miles below the lower end of Swan Valley, 2 miles above Lyon post office, in sec. 3, T. 1 N., R. 43 E., Boise meridian, was established April 18, 1903.

As the South Fork of Snake River receives no tributaries below this point the records show the total amount of water available from the South Fork for irrigation below and for storage in the Swan Valley Reservoir site just above. Between this station and Jackson Lake, above, a number of important tributaries enter, the run-off at Lyon being about four times that at Moran. Chief among these tributaries are Buffalo River, which enters about 6 miles below Moran; Gros Ventre River, which comes in near Jackson, Wyo., about 30 miles below Moran; and John Day and Salt Rivers, which enter near the Idaho-Wyoming line, about 60 miles below Moran. Only a small amount of water is diverted above this station for irrigation on small ranches along the river.

An inclined staff gage is located on the north bank about 300 feet below the iron bridge and 1 mile above the cable station. The gage datum remained unchanged from October 16, 1904, to August 25, 1909. On August, 25, 1909, a chain gage was constructed directly across the river from the inclined gage with a datum 0.6 foot lower than that of the old gage. Readings on this gage from August 26 to December 31, 1909, have been corrected by a constant equation to make them comparable with previous readings. Gage heights for 1910 are referred to the datum of the chain gage.

Discharge measurements are made by means of a cable at the old site of Wedekinds Ferry.

Winter records are affected by ice. Artificial control above causes some irregularities in the daily flow, but there is no effect from artificial control below.

Discharge measurements of South Fork of Snake River near Lyon, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 5	O. W. Hartwell	366	2,030	4.0	6,340
July 5	do	275	2,000	5.11	9,120
26	La Rue and Jacob	275	1,890	4.52	7,420
31	Lynn Crandall	274	1,790	4.20	6,880
Sept. 26	O. W. Hartwell	260	1,380	2.78	2,820

Daily gage height, in feet, of South Fork of Snake River near Lyon, Idaho, for 1910.

[Later, Smith, and Clark, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	3.15	.....	7.9	8.1	.....	4.25	3.15	2.7	2.7	2.75
2	.....	3.4	3.05	.....	7.3	8.5	.....	4.15	3.15	2.7	2.65	2.7
3	4.5	3.35	3.0	.....	7.0	8.6	.....	4.05	3.1	2.7	2.65	2.7
4	7.0	3.3	2.95	.....	6.9	8.1	.....	4.0	3.1	2.8	2.65	.....
5	8.5	3.3	2.9	4.0	7.1	7.9	5.1	3.95	3.1	2.7	2.65	2.7
6	8.5	3.3	2.8	4.2	7.0	7.6	7.1	3.9	3.1	2.7	.....	2.7
7	8.5	3.25	2.7	4.4	6.8	7.4	6.9	3.8	3.0	2.7	2.65	2.65
8	8.5	3.4	2.7	4.6	7.0	7.3	6.7	3.7	3.0	2.7	2.65	2.65
9	8.5	3.4	.....	4.7	7.5	6.9	6.5	3.7	2.9	.....	2.7	2.7
10	8.5	3.4	2.75	4.9	8.1	6.5	6.3	3.7	2.9	2.7	2.7	2.7
11	8.5	3.35	2.75	5.1	8.8	6.5	6.1	3.7	2.9	2.7	2.7	.....
12	8.5	3.3	2.8	5.2	8.9	6.4	6.0	3.7	2.9	2.7	2.7	2.7
13	8.5	3.3	2.8	5.4	8.7	6.6	5.9	3.7	2.8	2.7	.....	2.7
14	8.5	3.25	2.8	5.6	8.6	6.5	5.7	3.7	2.8	2.7	2.65	2.65
15	8.0	3.2	2.8	5.5	8.4	6.4	5.6	3.7	2.8	2.7	2.65	2.65
16	8.0	3.2	2.8	5.3	8.1	6.3	5.5	3.6	2.8	.....	2.65	2.65
17	3.7	3.2	2.85	5.4	7.7	6.2	5.45	3.5	2.8	2.85	2.65	2.65
18	3.7	4.5	2.9	5.6	7.4	6.2	5.4	3.5	2.8	2.85	2.65	.....
19	3.5	6.3	.....	5.9	7.3	6.2	5.3	3.5	2.8	2.85	2.65	2.6
20	3.5	9.5	.....	6.4	7.1	6.1	5.2	3.5	2.7	2.8	.....	2.6
21	3.5	9.5	.....	6.9	7.0	6.1	5.2	3.45	2.7	2.8	2.7	2.55
22	3.4	9.5	.....	6.7	6.9	6.0	5.0	3.4	2.8	2.8	2.75	2.55
23	3.45	9.5	.....	6.8	6.7	5.9	4.9	3.35	2.8	.....	2.8	2.5
24	4.5	3.7	.....	7.0	7.1	5.7	4.75	3.3	2.8	2.65	2.9	2.5
25	4.5	3.75	.....	7.2	7.5	5.6	4.6	3.3	2.8	2.7	2.8	.....
26	3.5	3.75	.....	7.5	7.7	5.5	4.55	3.3	2.8	2.7	2.8	2.5
27	3.45	.....	.....	7.9	7.6	5.5	4.5	3.3	2.75	2.7	.....	2.55
28	3.4	.....	.....	8.1	7.4	5.5	4.4	3.25	2.7	2.7	2.7	2.55
29	3.4	.....	.....	8.7	7.5	5.5	4.3	3.25	2.7	2.7	2.8	2.55
30	.....	.....	.....	8.3	7.7	5.5	4.2	3.2	2.7	.....	2.75	2.5
31	.....	.....	.....	.....	8.0	.....	4.2	3.2	.....	2.7	.....	2.5

NOTE.—Ice jams existed at the gage during January and February. Gage read to top of ice Jan. 3 to 16, and also Feb. 18 to 23. Observer absent Mar. 19 to Apr. 4.

Daily discharge, in second-feet, of South Fork of Snake River near Lyon, Idaho, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,020	.....	23,600	23,500	10,200	6,980	3,640	2,660	2,660	2,760
2	3,780	.....	20,400	25,500	9,800	6,600	3,640	2,660	2,560	2,660
3	3,660	.....	18,800	26,000	9,500	6,250	3,520	2,660	2,560	2,660
4	3,540	.....	18,300	23,700	9,300	6,070	3,520	2,870	2,560	2,660
5	3,430	6,340	19,300	22,200	9,080	5,900	3,520	2,660	2,560	2,660
6	3,200	6,970	18,800	20,600	17,900	5,700	3,520	2,660	2,560	2,660
7	2,980	7,630	17,800	19,500	16,800	5,360	3,300	2,660	2,560	2,560
8	2,980	8,300	18,800	18,900	15,900	5,040	3,300	2,660	2,560	2,660
9	3,040	8,640	21,400	16,800	14,900	4,990	3,080	2,660	2,660	2,660
10	3,090	9,360	24,600	15,000	14,100	4,990	3,080	2,660	2,660	2,660
11	3,090	10,100	28,400	15,000	13,200	4,990	3,080	2,660	2,660	2,660
12	3,200	10,500	29,000	14,500	12,800	4,990	3,080	2,660	2,660	2,660
13	3,200	11,400	27,900	15,400	12,400	4,990	2,870	2,660	2,610	2,660
14	3,200	12,200	27,300	15,000	11,500	4,990	2,870	2,660	2,560	2,560
15	3,200	11,800	26,100	14,500	11,100	4,990	2,870	2,660	2,560	2,560
16	3,200	11,000	24,300	14,000	10,800	4,730	2,870	2,820	2,560	2,560
17	3,320	11,400	22,200	13,600	10,600	4,480	2,870	2,980	2,560	2,560
18	3,430	12,200	20,600	13,600	10,400	4,480	2,870	2,980	2,560	2,510
19	.....	13,600	20,000	13,600	10,000	4,480	2,870	2,980	2,560	2,460
20	.....	15,900	18,900	13,200	9,600	4,480	2,660	2,870	2,610	2,460
21	.....	18,300	18,300	13,200	9,650	4,360	2,660	2,870	2,660	2,360
22	.....	17,300	17,800	12,700	8,900	4,230	2,870	2,870	2,760	2,360
23	.....	17,800	16,800	12,300	8,560	4,110	2,870	2,720	2,870	2,260
24	.....	18,800	18,700	11,500	8,080	3,990	2,870	2,560	3,080	2,260
25	.....	19,800	20,800	11,100	7,580	3,990	2,870	2,660	2,870	2,260
26	.....	21,400	21,800	10,700	7,460	3,990	2,870	2,660	2,870	2,260
27	.....	23,600	21,200	10,700	7,400	3,990	2,760	2,660	2,760	2,360
28	.....	24,600	20,100	10,700	7,180	3,870	2,660	2,660	2,660	2,360
29	.....	27,900	20,500	10,700	6,950	3,870	2,660	2,660	2,870	2,360
30	.....	25,700	21,500	10,700	6,750	3,750	2,660	2,660	2,760	2,260
31	.....	.....	23,000	.....	6,880	3,750	.....	2,660	.....	2,260

NOTE.—Daily discharge determined from three rating curves, each of which is only fairly well defined, and applicable for periods Mar. 1 to May 12, June 10 to July 5, and Aug. 9 to Dec. 31. May 13 to June 9 and July 6 to Aug. 8 obtained by indirect method for shifting channels. July 1 to 4 and Sundays of last quarter were interpolated.

Monthly discharge of South Fork of Snake River near Lyon, Idaho, for 1910.

[Drainage area, 5,480 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	.....	.....	3,800	0.693	0.80	234,000	D.
February	.....	.....	3,500	.639	.67	194,000	D.
March	4,020	2,980	3,390	.619	.71	208,000	C.
April	27,900	.....	13,400	2.45	2.73	797,000	B.
May	29,000	16,800	21,500	3.92	4.52	1,320,000	B.
June	26,000	10,700	15,600	2.85	3.18	928,000	B.
July	17,900	6,750	10,500	1.92	2.21	646,000	B.
August	6,980	3,750	4,820	.880	1.02	296,000	A.
September	3,640	2,660	3,030	.553	.62	180,000	A.
October	2,980	2,560	2,720	.496	.57	167,000	A.
November	3,080	2,560	2,670	.487	.54	159 000	B.
December	2,760	2,260	2,500	.456	.53	154,000	B.
The year	29,000	2,260	7,300	1.33	18.10	5,280,000	

NOTE.—Mean discharges estimated for January and February.
Estimated mean discharge Mar. 19–31, 3,500 second-feet. Estimated mean discharge Apr. 1–4, 5,000 second-feet.

SOUTH FORK OF SNAKE RIVER NEAR HEISE, IDAHO.

This station which is located 3 miles upstream from Heise, in sec. 5, T. 3 N., R. 41 E., Boise meridian, about 400 feet above the Anderson dam, was established September 25, 1910.

The station is located above all diversions on the South Fork, except one small ditch which has an estimated capacity of 20 second-feet. The records will be of value during the irrigating season in determining the amount of stored water from Jackson Lake available for distribution in the Minidoka and Twin Falls tracts.

The equipment consists of a staff gage, in two sections, and a car and cable. The gage heights are controlled by the Anderson Dam and by the headgates of the canal diverting at the dam. During 1910 the gage heights were affected by repair work on the dam and by the partial removal of temporary structures used in this work.

Daily gage height, in feet, of South Fork of Snake River near Heise, Idaho, for 1910.

[Parley Byington, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	1.5	2.0	1.8	16	.....	2.2	1.7	1.7
2	.....	1.6	2.0	1.75	17	.....	2.2	1.7	1.7
3	.....	1.6	2.0	1.8	18	.....	2.25	1.7	1.8
4	.....	1.8	2.0	1.9	19	.....	2.2	1.7	1.8
5	.....	1.8	2.0	1.8	20	.....	2.15	1.7	1.8
6	.....	1.85	2.0	1.75	21	.....	2.1	1.7	1.8
7	.....	1.9	1.9	1.65	22	.....	2.1	1.7	1.9
8	.....	2.0	1.8	1.65	23	.....	2.1	1.7	2.0
9	.....	2.0	1.7	1.7	24	.....	2.1	1.8	1.9
10	.....	2.1	1.7	1.7	25	1.3	2.1	1.9	1.9
11	.....	2.1	1.7	1.65	26	1.3	2.1	1.9	2.0
12	.....	2.1	1.7	1.65	27	1.4	2.05	1.8	2.0
13	.....	2.2	1.7	1.65	28	1.4	2.05	1.8	2.0
14	.....	2.2	1.7	1.65	29	1.45	2.05	1.8	2.0
15	.....	2.2	1.7	1.7	30	1.5	2.0	1.8	2.0
					31	.....	2.0	.....	2.1

NOTE.—Gage heights were affected by repair work on the dam below from Sept. 25 to Oct. 10. From Nov. 7 to 9 they were affected by the removal of a portion of a temporary dam below the gage.

Daily discharge, in second-feet, of South Fork of Snake River near Heise, Idaho, for 1910.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1	.....	3,170	11	3,010	2,930	21	3,010	.....
2	.....	3,090	12	3,010	2,930	22	3,010	.....
3	.....	3,170	13	3,010	2,930	23	3,010	.....
4	.....	3,340	14	3,010	2,930	24	3,170	.....
5	.....	3,170	15	3,010	3,010	25	3,340	.....
6	.....	3,090	16	3,010	3,010	26	3,340	.....
7	.....	2,930	17	3,010	3,010	27	3,170	.....
8	.....	2,930	18	3,010	.....	28	3,170	.....
9	.....	3,010	19	3,010	.....	29	3,170	.....
10	3,010	3,010	20	3,010	.....	30	3,170	.....

NOTE.—See foot notes to monthly estimate table.

Monthly discharge of South Fork of Snake River near Heise, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
September 25-30			[a] 3,000	35,700	C.
October			[a] 3,000	184,000	C.
November	3,340		3,060	182,000	C.
December	3,340		[b] 2,980	183,000	C.

[a] Estimated Sept. 25–Nov. 9 from study of gage heights and the Lyon records.
[b] Estimated Dec. 18–31 at 2,900 sec. ft.

SNAKE RIVER NEAR BLACKFOOT, IDAHO.

This station, which is located in sec. 30, T. 3 S., R. 34 E., Boise meridian, immediately below the mouth of Blackfoot River, about 2 miles east of Rich post office, and about 14 miles southwest of Blackfoot, was established June 6, 1910.

Portneuf and Bannock rivers are the principal tributaries between this station and the first station below at Neeley. A large amount of spring water also enters between this station and American Falls. Records at this station will indicate the amount of water available for a proposed storage reservoir at American Falls, and will also assist in determining the amount of water which is turned out of Jackson Lake and which would be available at the Minidoka and Twin Falls projects.

Discharge measurements are made by wading or from the cable located near the gage.

The datum of the gage remained constant during 1910.

Discharge measurements of Snake River near Blackfoot, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 10[a]	W. R. King	535	2,680	6.95	8,520
11[a]	do	531	2,560	6.82	8,080
12	do	525	2,310	6.32	6,700
13	do	455	2,160	6.04	5,940
14	do	445	2,040	5.78	5,320
15	do	430	1,990	5.58	4,840
16	do	430	1,870	5.34	4,440
17	do	405	1,790	5.18	4,050
18	do	395	1,740	4.99	3,680
19	do	385	1,680	4.84	3,450
20	do	385	1,620	4.70	3,230
21	do	380	1,560	4.49	2,880
22	do	370	1,490	4.30	2,560
23	do	365	1,440	4.15	2,320
24	do	360	1,390	3.99	2,060
25	do	355	1,350	3.87	1,980
26	do	355	1,320	3.79	1,880
27	do	345	1,240	3.60	1,630
28	do	340	1,180	3.40	1,440
28[b]	do	317	1,280	3.40	1,410
29	do	340	1,160	3.29	1,300
30	do	335	1,090	3.10	1,120
Aug. 1	do	325	1,000	2.81	826
2	do	325	970	2.68	783

[a] Made by Hartwell and King. [b] Made by La Rue and Jacob.

Discharge measurements of Snake River near Blackfoot, Idaho, in 1910—Continued.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 3	W. R. King	255	299	2.61	627
4	do	250	301	2.60	618
5	do	245	280	2.50	523
6	do	230	249	2.31	446
7	do	235	256	2.35	472
8	do	230	245	2.25	404
9	do	215	209	2.01	308
10	do	215	200	1.96	265
11	do	210	190	1.90	248
12	do	195	189	1.90	241
13	do	195	187	1.90	244
14	do	195	185	1.90	241
15	do	195	184	1.89	219
16	do	200	191	1.91	241
17	do	200	191	1.90	243
18	do	215	211	2.00	289
19	do	215	208	2.02	294
20	do	215	217	2.09	337
21	do	225	230	2.19	369
22	do	235	261	2.38	478
23	do	235	264	2.40	481
24	do	225	247	2.32	437
25	do	235	261	2.37	467
26	do	235	274	2.42	507
27	do	245	286	2.52	551
28	do	250	312	2.67	675
29	do	250	329	2.75	742
30	do	265	377	3.01	942
31	do	270	375	3.07	935

NOTE.—Measurements during July were made from the cable. Measurements of Aug. 1 were made from a boat at the cable. The rest of the measurements were made by wading at a section one-quarter mile downstream.

Daily gage height, in feet, of Snake River near Blackfoot, Idaho, for 1910.

[J. A. Clough, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.85	2.81	3.14	3.56	4.62	5.00	16	6.95	5.34	1.90	3.40	4.20	4.79	4.70
2	.....	4.90	2.68	3.30	3.54	4.69	4.94	17	6.60	5.17	1.92	3.44	4.35	4.71	4.42
3	.....	4.80	2.61	3.32	3.56	4.70	4.94	18	6.50	4.97	2.01	3.39	4.40	4.75	4.40
4	.....	4.80	2.55	3.32	3.73	4.51	4.94	19	6.40	4.83	2.03	3.38	4.47	4.80	4.80
5	.....	4.85	2.48	3.32	3.80	4.70	5.02	20	6.20	4.70	2.07	3.63	4.51	4.85	4.63
6	9.00	4.85	2.32	3.39	4.00	4.69	5.07	21	5.75	4.46	2.19	3.67	4.46	4.89	4.32
7	8.75	5.80	2.35	3.42	4.05	4.70	5.00	22	5.75	4.31	2.35	3.80	4.43	4.88	4.35
8	8.45	7.15	2.24	3.42	4.10	4.79	4.85	23	5.75	4.13	2.39	3.80	4.38	4.90	4.50
9	8.30	7.20	2.03	3.47	4.11	4.80	4.82	24	5.70	3.98	2.31	3.80	4.34	4.98	4.68
10	8.10	6.97	1.95	3.40	4.11	4.80	4.82	25	5.70	3.86	2.36	3.81	4.39	4.99	4.70
11	7.40	6.74	1.89	3.40	4.21	4.80	4.91	26	5.40	3.77	2.43	3.84	4.32	5.02	4.80
12	7.20	6.29	1.90	3.40	4.18	4.80	4.85	27	5.35	3.59	2.51	3.83	4.32	5.02	4.50
13	7.20	5.97	1.90	3.32	4.20	4.80	4.89	28	5.20	3.37	2.66	3.81	4.39	5.02	4.10
14	7.20	5.74	1.90	3.32	4.21	4.74	4.85	29	5.10	3.28	2.79	3.79	4.39	4.98	4.40
15	7.20	5.55	1.89	3.34	4.30	4.75	4.80	30	4.90	3.08	3.00	3.79	4.45	4.95	4.51
								31	.....	2.91	3.07	.....	4.49	.....	4.20

NOTE.—Slush ice floating in the river reported for Dec. 26 to 31.

Daily discharge, in second-feet, of Snake River near Blackfoot, Idaho, for 1910.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3,470	799	1,120	1,590	3,070	3,740
2	.....	3,560	689	1,300	1,570	3,190	3,630
3	.....	3,380	633	1,320	1,590	3,210	3,630
4	.....	3,380	590	1,320	1,790	2,900	3,630
5	.....	3,470	543	1,320	1,880	3,210	3,780
6	17,100	3,470	448	1,390	2,130	3,190	3,870
7	16,000	5,390	465	1,430	2,200	3,210	3,740
8	14,600	9,340	405	1,430	2,270	3,360	3,470
9	13,900	9,510	301	1,490	2,280	3,380	3,420
10	13,100	8,720	264	1,400	2,280	3,380	3,420
11	10,200	7,960	238	1,400	2,440	3,380	3,580
12	9,510	6,620	242	1,400	2,390	3,380	3,470
13	9,510	5,800	242	1,320	2,420	3,380	3,540
14	9,510	5,250	242	1,320	2,440	3,280	3,470
15	9,510	4,820	238	1,340	2,570	3,300	3,380
16	8,650	4,390	242	1,400	2,420	3,360	3,210
17	7,520	4,050	251	1,450	2,640	3,230	2,750
18	7,220	3,690	292	1,390	2,720	3,300	2,720
19	6,930	3,430	301	1,380	2,830	3,380	3,380
20	6,380	3,210	320	1,670	2,900	3,470	3,090
21	5,280	2,820	379	1,720	2,820	3,540	2,600
22	5,280	2,580	465	1,880	2,770	3,520	2,640
23	5,280	2,320	487	1,880	2,690	3,560	2,880
24	5,160	2,100	443	1,880	2,630	3,700	3,180
25	5,160	1,950	471	1,890	2,700	3,720	3,210
26	4,510	1,840	512	1,920	2,600	3,780	3,380
27	4,410	1,620	562	1,910	2,600	3,780	2,880
28	4,110	1,370	673	1,890	2,700	3,780	2,270
29	3,920	1,270	782	1,860	2,700	3,700	2,720
30	3,560	1,060	975	1,860	2,800	3,650	2,900
31	.....	890	1,050	.....	2,860	.....	2,420

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Snake River near Blackfoot, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 6-30	17,100	3,560	8,250	409,000	A.
July	9,510	890	3,960	243,000	A.
August	1,050	238	469	28,800	A.
September	1,920	1,120	1,540	91,600	A.
October	2,900	1,570	2,430	149,000	A.
November	3,780	2,900	3,410	203,000	A.
December	3,870	2,270	3,230	199,000	A.
The period	.....	.....	.....	1,320,000	

SNAKE RIVER AT NEELEY, IDAHO.

This station, which is located in sec. 11, T. 8 S., R. 30 E., Boise meridian, one-half mile north of Neeley post office, Idaho, 4 miles southwest of American Falls, the nearest railway point, and about 32 miles above the Minidoka dam, was established March 17, 1906.

The principal tributaries above this station are Blackfoot and Portneuf rivers. Raft River enters the Snake between Neeley and the Minidoka dam.

A large amount of water is diverted above this station by canals in the Idaho Falls irrigation district. During years of low precipitation Snake River is dry at Blackfoot, but a flow of about 2,000 second-feet is formed at Neeley by the water from Blackfoot and Portneuf rivers and from springs in or near the river channel between Blackfoot and Neeley.

An automatic gage was installed August 8, 1910. This gage and the staff gage previously used are on the left bank at the cable. Another cable, installed by private parties, is about 100 feet upstream. The gage datum has remained unchanged since the station was established.

The rating curve is well defined and the records may be considered good.

Discharge measurements of Snake River at Neeley, Idaho, in 1910.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 24	O. W. Hartwell	7.42	14,200	July 25	H. L. Stoner	4.65	4,410
25	do	7.65	14,800	26	do	4.60	4,230
26	La Rue and Hartwell	7.64	14,900	27	do	4.55	4,190
27	do	7.49	14,300	28	Stoner and Porter	4.51	4,100
28	O. W. Hartwell	7.38	13,500	29	Stoner and Jacob	4.40	3,800
29	do	7.28	13,300	30	C. C. Jacob	4.37	3,550
30	do	7.18	13,200	31	do	4.30	3,440
July 4	H. L. Stoner	5.08	5,700	Aug. 1	do	4.25	3,330
5	do	5.10	5,780	2	do	4.18	3,220
6	do	5.02	5,680	3	do	4.10	3.040
7	do	5.07	5,630	4	do	4.08	2,930
8	do	5.91	8,220	5	H. L. Stoner	4.08	2,960
9	do	6.78	11,600	6	C. C. Jacobs	4.04	2,890
9	do	6.80	11,500	7	do	4.00	2,780
10	do	6.79	11,200	8	do	4.00	2,950
11	do	6.61	10,700	9	do	3.98	2,840
11	do	6.59	10,700	10	Stoner and Meech	3.95	2,800
12	do	6.45	10,100	12	H. L. Stoner	3.90	2,600
12	do	6.29	9,640	13	do	3.90	2,640
13	do	6.09	8,750	14	Stoner and Meech	3.88	2,570
13	do	6.02	8,630	15	H. L. Stoner	3.90	2,720
14	do	5.83	7,740	16	do	3.88	2,380
14	do	5.89	8,080	17	do	3.90	2,300
15	do	5.72	7,620	18	do	3.90	2,320
16	do	5.58	7,090	19	do	3.92	2,410
17	do	5.42	6,480	20	do	3.92	2,440
18	do	5.30	6,070	22	do	3.94	2,530
19	do	5.20	5,860	25	do	3.97	2,660
20	do	5.10	5,620	26	do	3.98	2,640
21	do	5.06	5,450	27	do	4.02	2,760
22	do	4.90	4,920	30	do	4.18	3,160
23	do	4.80	4,790	31	do	4.24	3,300
24	do	4.72	4,460	Sept. 13	do	4.40	3,470

NOTE.—Measurements Aug. 16 to Sept. 13 made from the private cable 100 feet above the Geological Survey cable.

Daily height, in feet, of Snake River at Neeley, Idaho, for 1910.

[Miss Consuella Hunt and J. J. Sorensen, observers.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	6.90	10.70	8.54	5.27	4.25	4.30	4.66	5.09	5.30
2	6.40	6.89	10.84	8.67	5.24	4.15	4.32	.....	5.13	5.33
3	6.50	7.00	10.82	8.90	5.25	4.10	4.35	.....	5.18	5.32
4	6.55	7.10	10.80	8.80	5.09	4.10	4.42	.....	5.18	5.37
5	6.60	7.07	10.62	8.78	5.10	4.11	4.42	.....	5.19	5.35
6	6.57	7.05	10.45	8.62	5.04	4.04	4.44	.....	5.18	5.36
7	6.53	7.00	9.40	8.53	5.09	4.00	4.44	.....	5.20	5.37
8	6.60	6.90	9.22	8.35	6.09	3.99	4.45	4.83	5.22	5.31
9	6.65	7.00	9.20	8.00	6.78	3.97	4.47	4.85	5.24	5.28
10	6.68	7.20	9.30	7.73	6.77	3.94	4.49	4.85	5.25	5.23
11	6.70	7.35	9.50	7.40	6.62	3.92	4.45	4.87	5.27	5.26
12	6.68	7.90	10.00	7.15	6.38	3.91	4.45	4.90	5.28	5.30
13	6.67	8.15	10.30	6.91	6.08	3.90	4.43	4.89	5.25	5.28
14	6.69	8.33	10.40	6.84	5.88	3.89	4.47	4.90	5.24	5.25
15	6.64	8.55	10.20	6.83	5.71	3.89	4.47	4.90	5.23	5.22
16	6.57	8.61	10.30	6.82	5.57	3.88	4.48	4.95	5.21	5.18
17	6.48	8.40	10.10	6.63	5.39	3.90	4.52	4.97	5.20	5.11
18	6.51	8.20	9.70	6.47	5.3	3.90	4.55	4.98	5.19	.....
19	6.55	8.10	9.30	6.36	5.21	3.92	4.60	5.00	5.22	.....
20	6.60	8.41	9.00	6.24	5.11	3.92	4.65	5.03	5.22	.....
21	6.65	8.75	8.60	6.00	5.04	3.92	4.61	5.06	5.24	.....
22	6.70	9.00	8.38	5.95	4.9	3.94	4.61	5.05	5.30	.....
23	7.00	9.41	8.10	5.90	4.81	3.97	4.66	5.03	5.29	.....
24	7.43	9.43	8.00	5.85	4.74	3.99	4.67	5.01	5.31	.....
25	7.73	9.45	7.80	5.79	4.68	3.97	4.67	4.99	5.32	.....
26	7.65	9.69	8.11	5.72	4.61	4.00	4.68	4.98	5.35	.....
27	7.55	9.85	8.36	5.67	4.55	4.03	4.69	4.96	5.37	.....
28	7.40	10.00	8.62	5.45	4.49	4.07	4.70	4.96	5.38	.....
29	7.25	10.35	8.59	5.38	4.41	4.14	4.70	4.99	5.36	.....
30	7.18	10.50	8.55	5.27	4.38	4.18	4.69	5.04	5.29	.....
31	7.05	.....	8.70	.....	4.31	4.26	.....	5.07	.....	.....

NOTE.—Records obtained from automatic gage after Aug. 8. Gage failed to register Oct. 2 to 7. Ice present previous to Mar. 1 and after Dec. 17.

Daily discharge, in second-feet, of Snake River at Neeley, Idaho, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	9,500	12,000	31,000	19,400	6,130	3,340	3,450	4,350	5,570	6,220
2	10,000	12,000	31,800	20,100	6,030	3,120	3,500	[a] 4,400	5,690	6,310
3	10,400	12,400	31,700	21,300	6,060	3,020	3,500	[a] 4,400	5,850	6,280
4	10,600	12,800	31,600	20,800	5,570	3,020	3,730	[a] 4,400	5,850	6,440
5	10,800	12,700	30,600	20,700	5,600	3,040	3,730	[a] 4,400	5,880	6,380
6	10,700	12,600	29,600	19,800	5,420	2,900	3,780	[a] 4,400	5,850	6,410
7	10,500	12,400	23,900	19,400	5,570	2,820	3,780	[a] 4,400	5,910	6,440
8	10,800	12,000	22,900	18,500	8,870	2,800	3,800	4,810	5,970	6,250
9	11,000	12,400	22,800	16,800	11,500	2,770	3,860	4,870	6,030	6,160
10	11,100	13,200	23,400	15,600	11,500	2,710	3,900	4,870	6,060	6,000
11	11,200	13,800	24,400	14,100	10,900	2,680	3,800	4,930	6,130	6,100
12	11,100	16,300	27,100	13,000	9,950	2,660	3,800	5,010	6,160	6,220
13	11,100	17,500	28,800	12,000	8,840	2,640	3,760	4,980	6,060	6,160
14	11,200	18,400	29,300	11,800	8,110	2,620	3,860	5,010	6,030	6,060
15	11,000	19,500	28,200	11,700	7,530	2,620	3,860	5,010	6,000	5,970
16	10,700	19,800	28,800	11,700	7,070	2,610	3,880	5,160	5,940	5,850
17	10,300	18,700	27,700	10,900	6,500	2,640	3,980	5,210	5,910	5,630
18	10,400	17,700	25,500	10,300	6,220	2,640	4,060	5,240	5,880	.....
19	10,600	17,300	23,400	9,870	5,940	2,680	4,190	5,300	5,970	.....
20	10,800	18,800	21,800	9,430	5,630	2,680	4,320	5,390	5,970	.....
21	11,000	20,500	19,700	8,540	5,420	2,680	4,220	5,480	6,030	.....
22	11,200	21,800	18,600	8,360	5,010	2,710	4,220	5,450	6,220	.....
23	12,400	23,900	17,300	8,180	4,760	2,770	4,350	5,390	6,190	.....
24	14,200	24,000	16,800	8,010	4,570	2,800	4,380	5,330	6,250	.....
25	15,600	24,100	15,900	7,810	4,410	2,770	4,380	5,270	6,280	.....
26	15,200	25,400	17,300	7,570	4,220	2,820	4,410	5,240	6,380	.....
27	14,700	26,300	18,500	7,400	4,060	2,880	4,430	5,180	6,440	.....
28	14,100	27,100	19,800	6,690	3,900	2,960	4,460	5,180	6,470	.....
29	13,400	29,100	19,700	6,470	3,700	3,100	4,460	5,270	6,410	.....
30	13,100	29,900	19,500	6,130	3,630	3,190	4,430	5,420	6,190	.....
31	12,600	.....	20,200	.....	3,470	3,360	.....	5,510	.....	.....

[a] Estimated.

NOTE.—Daily discharge determined from a well-defined rating curve. Discharge Mar. 1 estimated.

Monthly discharge of Snake River at Neeley, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	15,600	[a] 9,500	11,700	719,000	A.
April	29,900	12,000	18,500	1,100,000	A.
May	31,800	15,900	24,100	1,480,000	A.
June	21,300	6,130	12,700	756,000	A.
July	11,500	3,470	6,330	389,000	A.
August	3,360	2,610	2,840	175,000	A.
September	4,460	3,450	4,010	239,000	A.
October	5,510	4,350	5,010	308,000	A.
November	6,470	5,570	6,050	360,000	A.
December	6,440	.....	5,730	352,000	B.
The period	.....	.....	.....	5,880,000	

[a] Estimated.

NOTE.—Mean discharge estimated at 4,400 second-feet for Oct. 2 to 7 and 5,200 second-feet for Dec. 18 to 31.

SNAKE RIVER BELOW MINIDOKA DAM, AT HOWELL'S FERRY, IDAHO.

This station, which is located at Howell's Ferry, in sec. 2, T. 9 S., R. 25 E., Boise meridian, about 1 mile below the Minidoka dam of the United States Reclamation Service, was established April 21, 1910, to replace the old station at Montgomery's Ferry, about 7 miles downstream.

No tributaries enter Snake River between this point and Montgomery's Ferry and the discharge at the two stations should be practically the same.

The gage is an inclined staff on the left bank. Discharge measurements are made from a car and cable located about 250 feet below the ferry and a short distance below the gage.

Records at this station will indicate the amount of water passing the Minidoka dam and will be of importance during the irrigating season in distributing the normal and stored flow between the Minidoka and Twin Falls projects.

The channel shifts slightly, but a good rating curve was developed for 1910 from 1910 and 1911 measurements. The gage-height records are believed to be unreliable, however, for portions of May and December.

Discharge measurements of Snake River below Minidoka dam, at Howell's Ferry, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 20	O. W. Hartwell	476	2,840	6.50	6,250
July 3	L. W. Jordan	445	2,280	5.25	3,450
4	do	449	2,340	5.3	3,650
5	do	450	2,080	5.48	3,910
6	do	452	2,520	5.8	4,640
7	do	456	2,680	6.2	5,510
7	do	459	2,530	5.95	4,570
8	do	460	3,180	7.25	8,190
9	do	460	3,270	7.48	9,320
10	do	460	3,340	7.6	9,510
11	do	456	2,730	6.35	6,060
11	do	456	2,770	6.4	6,040
12	do	457	2,770	6.4	6,060
12	do	456	2,640	6.1	5,190
13	do	458	2,710	6.3	5,880
14	do	454	2,570	5.9	5,050
15	do	454	2,620	6.0	5,040
16	do	454	2,570	5.85	4,620
17	do	456	2,660	6.1	5,320
18	do	454	2,600	5.97	5,020
19	do	450	2,430	5.59	4,150
20	do	455	2,360	5.39	3,740
21	do	452	2,260	5.22	3,360
23	do	452	2,340	5.4	3,800
24	do	453	2,350	5.43	3,780
24	do	444	2,250	5.15	3,280
25	do	449	2,340	5.39	3,720
26	do	445	2,250	5.2	3,260
27	do	441	2,200	5.1	3,140
28	do	442	2,160	4.99	3,060
29	do	444	2,200	5.05	3,050
30	do	442	2,150	5.0	2,960
31	do	444	2,150	5.0	2,970
31	do	442	2,110	4.89	2,660
Aug. 1	do	440	2,110	4.92	2,830
2	do	440	2,060	4.8	2,660
3	do	440	2,060	4.79	2,540
4	do	441	2,020	4.69	2,360
5	do	440	1,980	4.65	2,270
6	do	439	1,980	4.6	2,290
7	do	439	1,980	4.6	2,270
8	do	441	2,020	4.71	2,570
9	do	440	2,010	4.64	2,340
10	do	439	1,980	4.62	2,330
11	do	439	1,980	4.6	2,310
12	do	441	1,980	4.62	2,320
13	do	441	2,000	4.66	2,370
14	do	439	1,930	4.51	2,100
15	do	438	1,930	4.51	2,210
16	do	438	1,950	4.55	2,220
17	do	442	2,030	4.75	2,400
18	do	440	1,980	4.63	2,320
19	do	441	2,020	4.68	2,390
20	do	436	1,890	4.41	2,040
21	do	436	1,850	4.31	1,860
22	do	436	1,890	4.40	2,010
23	do	436	1,890	4.40	2,010
24	do	438	1,930	4.51	2,140
25	do	438	1,930	4.50	2,160
26	do	442	2,020	4.71	2,500
27	do	444	2,110	4.91	2,780
28	do	441	2,020	4.70	2,440
29	do	441	2,020	4.69	2,450
30	do	441	1,980	4.62	2,270
31	do	441	1,980	4.62	2,340

Daily gage height, in feet, of Snake River below Minidoka dam, at Howell's Ferry, Idaho, for 1910.

[J. H. Foxley, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	11.75	.....	5.35	4.9	5.0	5.3	5.1	6.6
2	.....	11.75	.....	5.3	4.7	5.0	5.35	5.0	6.5
3	.....	11.55	.....	5.25	4.7	4.95	5.35	5.9	6.6
4	.....	11.05	.....	5.3	4.7	4.9	5.35	7.1	6.6
5	.....	10.65	.....	5.45	4.65	4.8	5.3	6.85	6.6
6	.....	10.4	.....	5.75	4.6	4.85	5.3	6.45	6.6
7	.....	10.25	.....	6.1	4.45	4.9	5.3	6.3	6.6
8	.....	10.3	.....	7.2	4.65	4.85	5.3	6.3	6.6
9	.....	10.2	.....	7.45	4.6	4.8	5.3	6.4	6.6
10	.....	10.05	.....	7.5	4.6	4.85	5.4	6.4	6.55
11	.....	10.3	.....	6.35	4.6	4.85	5.4	6.4	4.4
12	.....	10.65	.....	6.25	4.65	4.9	5.4	6.4	4.4
13	.....	11.0	.....	6.1	4.55	5.0	5.4	6.4	4.4
14	.....	11.4	.....	5.9	4.5	4.9	5.5	6.4	4.4
15	.....	11.55	.....	6.0	4.35	4.9	5.5	6.4	4.3
16	.....	11.15	.....	5.95	4.5	4.7	5.3	6.4	4.3
17	.....	11.0	.....	5.95	4.8	5.1	5.4	6.4	4.25
18	.....	10.75	.....	5.9	4.65	5.2	5.45	6.0	5.35
19	.....	10.15	6.35	5.6	4.6	5.4	5.7	5.3	6.2
20	.....	9.65	6.15	5.4	4.35	5.5	5.75	4.6	6.25
21	9.15	9.2	6.55	5.25	4.35	5.4	5.8	5.35	6.2
22	9.45	8.85	6.75	5.4	4.4	5.3	5.8	6.9	6.2
23	9.8	8.5	6.65	5.4	4.45	5.3	5.8	7.7	6.2
24	10.05	8.4	6.5	5.4	4.55	5.15	5.8	7.0	6.1
25	10.15	8.2	6.3	5.4	4.5	5.3	5.85	7.1	6.2
26	10.25	8.05	5.95	5.2	4.6	5.3	5.85	6.85	6.3
27	10.4	7.8	5.8	5.1	4.95	5.3	5.85	6.9	6.4
28	10.6	7.3	5.7	5.1	4.8	5.3	5.8	6.95	6.4
29	10.9	.....	5.6	5.05	4.7	5.3	5.8	6.85	6.3
30	11.3	.....	5.35	5.0	4.6	5.35	5.8	6.6	6.2
31	.....	.....	.....	5.0	4.8	.....	5.8	.....	.....

NOTE.—No observations May 29 to June 18. Recorded gage heights or latter part of May and for Dec. 11 to 18 believed to be unreliable.

Daily discharge, in second-feet, of Snake River below Minidoka dam, at Howell's Ferry, Idaho, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	26,400	.....	3,640	2,760	2,940	3,540	3,140	6,580
2	.....	26,400	.....	3,540	2,420	2,940	3,640	2,940	6,300
3	.....	25,600	.....	3,440	2,420	2,850	3,640	4,800	6,580
4	.....	23,500	.....	3,540	2,420	2,760	3,640	8,040	6,580
5	.....	21,800	.....	3,840	2,340	2,580	3,540	7,290	6,580
6	.....	20,700	.....	4,470	2,270	2,670	3,540	6,170	6,580
7	.....	20,100	.....	5,280	2,060	2,760	3,540	5,780	6,580
8	.....	20,300	.....	8,340	2,340	2,670	3,540	5,780	6,580
9	.....	19,900	.....	9,140	2,270	2,580	3,540	6,040	6,580
10	.....	19,300	.....	9,300	2,270	2,670	3,740	6,040	6,440
11	.....	20,300	.....	5,910	2,270	2,670	3,740	6,040	2,000
12	.....	21,800	.....	5,650	2,340	2,760	3,740	6,040	2,000
13	.....	23,300	.....	5,280	2,200	2,940	3,740	6,040	2,000
14	.....	24,900	.....	4,800	2,130	2,760	3,940	6,040	2,000
15	.....	25,600	.....	5,040	1,940	2,760	3,940	6,040	1,880
16	.....	23,900	.....	4,920	2,130	2,420	3,540	6,040	1,880
17	.....	23,300	.....	4,920	2,580	3,140	3,740	6,040	1,820
18	.....	22,200	.....	4,800	2,340	3,340	3,840	5,040	3,640
19	.....	19,700	5,910	4,140	2,270	3,740	4,360	3,540	5,520
20	.....	17,600	5,400	3,740	1,940	3,940	4,470	2,270	5,650
21	15,500	15,700	6,440	3,440	1,940	3,740	4,580	3,640	5,520
22	16,800	14,300	7,000	3,740	2,000	3,540	4,580	7,440	5,520
23	18,200	12,900	6,720	3,740	2,060	3,540	4,580	9,960	5,520
24	19,300	12,500	6,300	3,740	2,200	3,240	4,580	7,740	5,280
25	19,700	11,800	5,780	3,740	2,130	3,540	4,690	8,040	5,520
26	20,100	11,200	4,920	3,340	2,270	3,540	4,690	7,290	5,780
27	20,700	10,300	4,580	3,140	2,850	3,540	4,690	7,440	6,040
28	21,600	8,660	4,360	3,140	2,580	3,540	4,580	7,590	6,040
29	22,800	.....	4,140	3,040	2,420	3,540	4,580	7,290	5,780
30	24,500	.....	3,640	2,940	2,270	3,640	4,580	6,580	5,520
31	.....	.....	.....	2,940	2,580	.....	4,580	.....	5,500

NOTE.—Daily discharge determined from a rating curve constructed from measurements in 1910 and 1911; well defined below 11,000 second-feet and fairly well defined above. Determinations of discharge for latter part of May and Dec. 11 to 18 are of doubtful accuracy because of unreliable gage heights.

Monthly discharge of Snake River below Minidoka dam, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 21–30	24,500	15,500	19,900	395,000	B.
May 1–28	26,400	8,660	19,400	1,080,000	B.
June 19–30	7,000	3,640	5,430	129,000	A.
July	9,300	2,940	4,540	279,000	A.
August	2,850	1,940	2,290	141,000	A.
September	3,940	2,420	3,110	185,000	A.
October	4,690	3,540	4,050	249,000	A.
November	9,960	2,270	6,070	361,000	A.
December	6,580	1,820	5,030	309,000	C.

SNAKE RIVER NEAR MINIDOKA, IDAHO.

This station, which is located at Montgomery's Ferry, in sec. 19, T. 9 S., R. 25 E., on the stage road from Minidoka to Albion, was established August 3, 1895, and has been maintained continuously since that time, except during the year 1900. The station is 4 miles due east of Rupert, Idaho, 7 miles below the Minidoka dam, and 23 miles above the diversion dam of the Twin Falls canals at Milner. Measurements at Montgomery's Ferry indicate the amount of water available for the Twin Falls canals, but some seepage water is returned to the river from the Minidoka tract below the station.

Raft River is the only important tributary entering Snake River between this station and that at Neeley, about 35 miles above. No important tributaries enter below the station for a distance of 40 miles.

In dry years the discharge at the station falls below 2,000 second-feet during the latter part of July and August. As the water rights of the Twin Falls canals call for an amount considerably in excess of this, it has been customary to make up the deficiency with stored water from Jackson Lake, Wyo.

The gage heights are somewhat affected by ice during the winter months and by backwater from the Milner dam, but the records may be considered fairly good. Some irregularity of flow is caused by the opening and closing of the gates at the Minidoka dam.

The gage is an inclined staff in three sections located near the ferry. The gage datum has remained unchanged since August 28, 1905.

Discharge measurements are made from the ferryboat.

The station was discontinued December 31, 1910.

Discharge measurements of Snake River near Minidoka, Idaho, in 1910.

Date.		Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
			Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar.	24	G. C. Baldwin	862	5,940	5.42	12,800
	25	do	863	6,220	5.70	14,000
	26	do	866	6,420	5.94	14,800
	27	do	867	6.540	6.05	15,200
	28	do	864	6,270	5.77	13,800
	29	do	864	6,270	5.79	13,900
	30	do	862	6,130	5.67	13,400
July	2	H. G. Shank	780	2,960	2.17	3,390
	3	do	780	2,980	2.21	3,440
	5	do	785	3,110	2.42	3,800
	6	do	792	3,380	2.70	4,280
	7	do	811	4,080	3.54	5,810
	8	do	829	4,510	4.24	7,920
	9	do	830	4,640	4.31	8,220
	10	do	831	4,840	4.55	8,760
	11	do	820	3,980	3.39	5,380
	12	do	820	4,020	3.45	5,400
	13	do	820	4,000	3.41	5,180
	14	do	806	3,530	2.96	4,140
	15	do	808	3,630	3.07	4,400
	16	do	812	3,830	3.30	5,020
	17	do	812	3,750	3.22	4,860
	18	do	808	3,660	3.10	4,750
	19	do	801	3,410	2.79	4,080
	20	do	792	3,260	2.59	3,550
	21	do	786	3,200	2.50	3,620
	21	do	786	3,080	2.40	3,410
	21	E. A. Porter	786	3,080	2.40	3,390
	23	H. G. Shank	786	3,170	2.46	3,660
	24	do	785	3,090	2.37	3,530
	25	do	786	3,130	2.39	3,580
	26	do	781	2,950	2.19	3,200
	27	do	778	2,900	2.14	3,180
	28	do	775	2,850	2.07	3,060
	29	do	775	2,790	1.99	2,930
	30	do	772	2,730	1.90	2,820
	31	do	871	2,700	1.87	2,810
Aug.	1	do	770	2,670	1.83	2,840
	2	do	768	2,580	1.70	2,460
	3	do	767	2,500	1.59	2,350
	4	do	766	2,440	1.53	2,300
	5	do	763	2,380	1.45	2,110
	6	do	763	2,370	1.44	2,100
	7	do	763	2,360	1.43	2,080
	8	do	766	2,440	1.52	2,270
	9	do	765	2,370	1.44	2,180
	10	do	764	2,350	1.42	2,160
	11	do	761	2,320	1.40	2,200
	12	do	761	2,330	1.38	2,120
	13	do	764	2,390	1.46	2,220
	14	do	760	2,250	1.29	2,020
	15	do	759	2,180	1.21	1,980
	16	do	760	2,260	1.29	2,100
	17	do	760	2,300	1.33	2,130
	18	do	758	2,150	1.21	2,010
	19	do	765	2,400	1.46	2,380
	20	do	758	2,220	1.23	1,980
	21	do	757	2,120	1.09	1,780
	22	do	757	2,180	1.17	1,930
	24	do	765	2,420	1.46	2,290
	25	do	758	2,240	1.25	2,070
	26	do	760	2,280	1.35	2,180
	27	do	770	2,570	1.69	2,830
	28	do	770	2,590	1.71	2,730
	29	do	765	2,440	1.50	2,330
	30	do	761	2,360	1.41	2,190
	31	do	761	2,360	1.42	2,240

Daily gage height, in feet, of Snake River near Minidoka, Idaho, for 1910.

[Geo. Montgomery, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.7	4.95	4.45	5.4	9.65	6.9	2.3	1.75	1.7	2.4	2.5	3.4
2	4.95	4.8	5.55	5.25	9.7	6.95	2.2	1.7	1.8	2.7	1.65	3.4
3	4.75	4.6	5.55	5.15	9.55	7.1	2.2	1.6	1.8	2.55	2.7	3.3
4	4.5	4.3	5.2	5.3	9.1	7.3	2.15	1.55	1.8	2.7	3.6	3.35
5	4.45	4.25	4.9	5.35	8.5	7.55	2.5	1.5	1.6	2.65	3.85	3.6
6	4.4	4.2	4.7	5.3	8.15	7.5	3.0	1.4	1.7	2.3	3.45	3.7
7	4.4	4.25	4.7	5.2	7.95	7.2	3.25	1.4	1.7	2.2	3.2	3.6
8	4.35	4.3	4.9	5.15	7.95	6.7	4.3	1.5	1.8	2.15	3.2	3.45
9	4.3	4.2	4.7	5.1	7.75	6.2	4.7	1.45	1.7	2.1	3.2	3.3
10	4.4	4.25	4.5	5.3	7.7	6.0	4.8	1.4	1.7	2.2	3.2	3.25
11	4.4	4.3	4.55	5.5	7.9	5.5	3.55	1.45	1.7	2.2	3.2	3.25
12	4.4	4.45	4.8	5.65	8.25	5.0	3.6	1.4	1.75	2.25	3.25	3.2
13	4.4	4.45	4.8	6.2	8.65	4.7	3.4	1.3	1.9	2.3	3.25	3.4
14	4.55	4.45	4.8	6.65	8.95	3.95	3.0	1.25	1.8	2.25	3.3	3.3
15	4.7	5.7	4.8	6.7	9.3	4.05	3.15	1.25	1.8	2.2	3.4	3.2
16	4.9	6.0	4.8	6.9	9.1	4.0	3.15	1.4	1.85	2.1	3.55	3.2
17	5.05	6.0	4.7	6.95	8.9	4.0	3.25	1.5	2.0	2.15	3.4	3.1
18	5.2	6.3	4.6	6.85	8.5	3.3	3.05	1.5	2.15	2.3	2.95	3.0
19	5.1	6.25	4.6	6.6	8.2	3.6	2.80	1.3	2.4	2.45	2.15	3.0
20	5.0	5.85	4.6	6.7	7.7	3.4	2.50	1.3	2.7	2.65	1.9	2.9
21	4.9	5.45	4.65	6.9	7.1	3.2	2.40	1.1	2.7	2.7	2.4	3.0
22	5.0	4.8	4.9	7.05	6.9	4.3	2.45	1.2	2.5	2.7	3.3	3.35
23	5.0	4.45	5.3	7.3	6.55	3.7	2.4	1.4	2.5	2.65	3.8	3.15
24	5.1	4.25	5.45	7.8	6.2	3.55	2.3	1.35	2.5	2.6	3.95	2.95
25	5.05	4.1	5.75	7.95	5.95	3.3	2.35	1.25	2.45	2.6	3.75	3.3
26	5.35	4.0	5.9	8.0	6.05	3.2	2.25	1.3	2.35	2.65	3.7	3.0
27	5.35	3.9	6.0	8.2	6.25	3.05	2.1	1.7	2.3	2.7	3.7	3.25
28	5.25	4.0	5.8	8.35	6.55	2.75	2.0	1.7	2.3	2.7	3.7	3.55
29	5.05	.....	5.75	8.6	6.95	2.7	1.95	1.6	2.3	2.7	3.6	3.4
30	5.0	.....	5.6	9.15	6.95	2.6	1.9	1.4	2.25	2.7	3.5	3.3
31	4.95	.....	5.5	.....	7.05	.....	1.85	1.5	.....	2.7	.....	3.3

NOTE.—Ice present Jan. 1 to about Feb. 24, and also to a slight extent from Dec. 25 to 31.

Daily discharge, in second-feet, of Snake River near Minidoka, Idaho, for 1910.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	9,100	12,100	27,800	17,100	3,560	2,640	2,570	3,760	3,970	6,130
2	.....	12,600	11,600	28,000	17,300	3,370	2,570	2,710	4,400	2,500	6,130
3	.....	12,600	11,300	27,400	17,900	3,370	2,430	2,710	4,080	4,400	5,860
4	.....	11,400	11,800	25,600	18,600	3,280	2,360	2,710	4,400	6,670	6,000
5	.....	10,500	11,900	23,200	19,500	3,970	2,300	2,430	4,290	7,360	6,670
6	.....	9,870	11,800	21,800	19,300	5,150	2,170	2,570	3,560	6,260	6,940
7	.....	9,870	11,400	21,000	18,200	4,950	2,170	2,570	3,370	5,590	6,670
8	.....	10,500	11,300	21,000	16,400	7,770	2,300	2,710	3,280	5,590	6,260
9	.....	9,870	11,100	20,200	14,700	8,940	2,240	2,570	3,190	5,590	5,860
10	.....	9,250	11,800	20,100	14,000	9,240	2,170	2,570	3,370	5,590	5,720
11	.....	9,410	12,400	20,800	12,400	5,720	2,240	2,570	3,370	5,590	5,720
12	.....	10,200	12,900	22,200	10,800	5,850	2,170	2,640	3,460	5,720	5,590
13	.....	10,200	14,700	23,800	9,870	5,320	2,050	2,860	3,560	5,720	6,130
14	.....	10,200	16,200	25,000	7,640	4,440	1,990	2,710	3,460	5,860	5,860
15	.....	10,200	16,400	26,400	7,920	4,740	1,990	2,710	3,370	6,130	5,590
16	.....	10,200	17,100	25,600	7,780	4,740	2,170	2,780	3,190	6,540	5,590
17	.....	9,870	17,300	24,800	7,780	4,950	2,300	3,020	3,280	6,130	5,320
18	.....	9,560	17,000	23,200	5,860	4,540	2,300	3,280	3,560	5,020	5,150
19	.....	9,560	16,100	22,000	6,670	4,070	2,050	3,760	3,860	3,280	5,150
20	.....	9,560	16,400	20,100	6,130	3,580	2,050	4,400	4,290	2,860	4,890
21	.....	9,720	17,100	17,900	5,590	3,430	1,810	4,400	4,400	3,760	5,150
22	.....	10,500	17,700	17,100	8,650	3,500	1,930	3,970	4,400	5,860	6,000
23	.....	11,800	18,600	15,900	6,940	3,430	2,170	3,970	4,290	7,220	5,460
24	.....	12,200	20,400	14,700	6,540	3,290	2,110	3,970	4,180	7,640	5,020
25	8,070	13,200	21,000	13,800	5,860	3,360	1,990	3,860	4,180	7,080	5,860
26	7,780	13,700	21,200	14,200	5,590	3,220	2,050	3,660	4,290	6,940	5,150
27	7,500	14,000	22,000	14,800	5,280	3,020	2,570	3,560	4,400	6,940	5,720
28	7,780	13,400	22,600	15,900	4,520	2,910	2,570	3,560	4,400	6,940	6,540
29	.....	13,200	23,600	17,300	4,400	2,870	2,430	3,560	4,400	6,670	6,130
30	.....	12,700	25,800	17,300	4,180	2,830	2,170	3,460	4,400	6,400	5,860
31	.....	12,400	.....	17,700	.....	2,790	2,300	.....	4,400	.....	5,860

NOTE.—Daily discharge determined from two fairly well defined rating curves, one applicable Feb. 25 to July 6 and Aug. 1 to Dec. 31, and the other July 7 to 31.

Monthly discharge of Snake River near Minidoka, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean		
March	14,000	9,250	11,000	676,000	B.
April	25,800	11,100	16,100	958,000	B.
May	28,000	13,800	20,900	1,290,000	B.
June	19,500	4,180	10,400	619,000	B.
July	9,240	2,790	4,390	270,000	A.
August	2,640	1,810	2,220	136,000	A.
September	4,400	2,430	3,160	188,000	B.
October	4,400	3,190	3,900	240,000	B.
November	7,640	2,500	5,730	341,000	B.
December	6,940	4,890	5,810	357,000	B.
The period				5,190,000	

NORTH SIDE MINIDOKA CANAL NEAR MINIDOKA, IDAHO.

This station, which is located about 350 feet below the head gates at the Minidoka dam, was established by the United States Reclamation Service May 1, 1909.

The records show the total amount of water diverted from Snake River on the north side at the Minidoka dam for irrigation on the Minidoka project.

The canal runs through a rock cut in the vicinity of the station, and the velocity is rather high for obtaining the best results.

Gage heights are obtained by means of a Friez automatic gage. Discharge measurements are made from a footbridge at the gage.

Discharge measurements of North Side Minidoka canal near Minidoka, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 21	O. W. Hartwell	43	235	6.51	814
21	do	43	260	6.51	834
30	do	41	252	6.71	840
June 7	do	46	307	8.18	1,200
16	do	45	304	8.12	1,180
July 13	Jordan and Hillman	43	317	8.28	1,160
17	Hartwell and Jordan	46	313	8.28	1,220
18	Crandall and Jordan	45	306	8.13	1,130
19	do	43	305	8.22	1,170
20	L. W. Jordan	45	293	7.97	1,140
24	Jordan and Millikin	43	293	7.91	1,110
Aug. 6	L. W. Jordan	43	284	7.73	1,070
20	Jordan and Millikin	43	268	7.33	959
25	L. W. Jordan	32	70	2.14	98
26	Jordan and Millikin	43	290	7.84	1,025
27	L. W. Jordan	42	274	7.47	968

Daily gage height, in feet, of North Side Minidoka canal near Minidoka, Idaho, for 1910.

[T. S. Millikin, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	6.80	.....	8.11	7.94	7.20	5.32	4.48
2	.....	6.80	.....	8.12	7.94	3.67	5.30	3.58
3	.....	.....	.....	8.10	7.94	2.04	5.31	3.37
4	.....	.....	8.15	8.07	7.94	1.88	5.28	1.12
5	.....	.....	8.18	8.02	7.99	1.84	5.30	1.57
6	.....	.....	8.17	7.99	7.86	1.84	5.32	3.14
7	.....	6.11	8.06	7.98	7.82	5.33	5.33	3.14
8	.....	6.10	8.02	8.12	3.03	6.50	5.41	3.13
9	.....	6.09	8.11	8.20	2.09	6.69	.....	3.13
10	.....	6.57	8.12	8.23	2.16	6.71	.....	3.13
11	.....	6.90	8.10	8.25	2.05	6.72	.....	.....
12	.....	6.93	8.11	8.25	7.70	6.60	.....	.....
13	.....	7.30	8.14	8.29	7.80	6.34	.....	.....
14	.....	7.57	8.20	8.31	7.83	6.08	.....	.....
15	.....	7.59	8.22	8.31	7.83	5.97	5.52	.....
16	.....	7.58	8.12	8.32	7.77	5.75	5.56	.....
17	.....	7.56	8.15	8.25	7.70	5.61	5.59	.....
18	6.11	7.51	8.12	8.19	7.57	5.53	5.55	.....
19	6.49	7.45	8.12	8.22	7.42	5.37	5.45	.....
20	6.59	7.39	8.10	8.01	6.94	5.28	5.43	.....
21	6.60	7.55	8.15	7.99	2.01	5.26	5.43	.....
22	6.62	7.68	8.08	7.97	1.70	5.25	5.45	.....
23	6.63	7.64	8.12	7.93	1.66	5.25	5.46	.....
24	.....	7.80	8.16	7.90	1.65	5.25	5.47	.....
25	.....	7.78	8.15	3.69	1.91	5.24	5.46	.....
26	.....	7.83	8.14	1.48	6.44	5.26	5.41	.....
27	.....	7.88	8.14	1.60	7.42	5.27	5.42	.....
28	.....	7.90	8.12	1.73	7.47	5.28	5.43	.....
29	.....	7.89	8.14	1.66	7.43	5.30	5.23	.....
30	.....	7.90	8.12	6.11	7.41	5.31	5.03	.....
31	.....	.....	.....	7.83	7.32	.....	5.02	.....

NOTE.—Canal gates opened Apr. 1 and closed for the season Nov. 11. No records obtained for days of missing gage heights between those dates.

Daily discharge, in second-feet, of North Side Minidoka canal near Minidoka, Idaho, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	880	1,130	1,160	1,120	960	584	432
2	.....	880	1,140	1,160	1,120	297	580	283
3	.....	850	1,150	1,150	1,120	90	582	249
4	.....	825	1,160	1,150	1,120	76	576	31
5	.....	800	1,170	1,140	1,130	73	580	54
6	.....	770	1,170	1,130	1,100	73	584	216
7	.....	742	1,150	1,130	1,090	586	586	216
8	.....	740	1,140	1,160	200	820	602	214
9	.....	738	1,160	1,180	94	858	605	214
10	.....	834	1,160	1,180	100	862	608	214
11	.....	900	1,150	1,190	90	864	610	.....
12	.....	906	1,160	1,190	1,070	840	614	.....
13	.....	980	1,160	1,200	1,090	788	618	.....
14	.....	1,040	1,180	1,200	1,090	736	620	.....
15	.....	1,040	1,180	1,200	1,090	714	624	.....
16	.....	1,040	1,160	1,200	1,080	670	632	.....
17	.....	1,040	1,160	1,190	1,070	642	638	.....
18	742	1,020	1,160	1,170	1,040	626	630	.....
19	818	1,010	1,160	1,180	1,000	594	610	.....
20	838	1,000	1,150	1,130	908	576	606	.....
21	840	1,030	1,160	1,130	87	573	606	.....
22	844	1,060	1,150	1,130	63	571	610	.....
23	846	1,050	1,160	1,120	60	571	612	.....
24	.....	1,090	1,170	1,110	60	571	614	.....
25	.....	1,080	1,160	300	78	569	612	.....
26	.....	1,090	1,160	49	808	573	602	.....
27	.....	1,110	1,160	56	1,000	575	604	.....
28	.....	1,110	1,160	65	1,020	576	606	.....
29	.....	1,110	1,160	60	1,010	580	567	.....
30	.....	1,110	1,160	742	1,000	582	531	.....
31	.....	1,120	.....	1,090	984	.....	530	.....

NOTE.—Daily discharge determined from a rating curve well defined above 500 second-feet and fairly well defined below. Discharge interpolated May 2 to 6, May 31 to June 3, and Oct. 9 to 14.

Monthly discharge of North Side Minidoka canal near Minidoka, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 18–23	846	742	821	9,770	B.
May	.....	738	968	59,500	B.
June	1,180	.....	1,160	69,000	B.
July	1,200	49	976	60,000	B.
August	1,130	60	771	47,400	B.
September	960	73	583	34,700	B.
October	638	530	598	36,800	B.
November 1–10	432	31	212	4,200	B.

SOUTH SIDE MINIDOKA CANAL NEAR MINIDOKA, IDAHO.

This station, which is located just below the head gates at the Minidoka dam, was established by the United States Reclamation Service April 2, 1909. Discharge measurements, however, were made by engineers of the Reclamation Service during 1908. The records show the total amount of water diverted from Snake River by the United States Reclamation Service for the irrigation of the South Side Minidoka tract.

The stage of the canal is recorded by a Friez automatic gage about 300 yards from the headworks, and measurements are made from a suspension footbridge located near the gage. The location of the automatic gage was changed somewhat between the seasons of 1909 and 1910.

Discharge measurements of South Side Minidoka canal near Minidoka, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 8	O. W. Hartwell	70	262	4.45	458
15	.....do	70	277	4.61	489
17	.....do	70	275	4.58	478
20	.....do	70	272	4.52	466
July 12	Jordan and Hillman	70	281	4.61	485
14	.....do	68	280	4.6	484
15	.....do	68	279	4.58	482
16	.....do	68	218	3.68	325
17	L. W. Jordan	68	222	3.77	342
18	Hartwell and Jordan	67	239	4.01	383
18	Hartwell and Crandall	67	239	4.01	381
23	L. W. Jordan	68	254	4.15	413
25	.....do	68	254	4.15	421
28	.....do	65	211	3.5	304
31	.....do	65	220	3.65	327
Aug. 1	.....do	67	234	3.98	373
2	.....do	67	236	3.98	370
3	.....do	66	233	3.97	367
4	.....do	66	226	3.81	342
6	Jordan and Brown	66	228	3.8	342
7	L. W. Jordan	65	214	3.6	320
8	Jordan and Millikin	64	200	3.39	280
12	L. W. Jordan	64	198	3.33	276
13	Jordan and Millikin	64	194	3.30	275
17	.....do	66	209	3.51	307
22	L. W. Jordan	66	203	3.43	280
25	.....do	58	182	3.10	246
27	.....do	58	181	3.10	239

Daily gage height, in feet, of South Side Minidoka canal near Minidoka, Idaho, for 1910.

[T. S. Millikin, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.	Oct.
1	2.59	4.33	4.58	3.77	3.13	2.72	16	3.03	4.49	2.99	3.49	.....	.....
2	2.52	4.48	4.59	3.74	3.07	2.72	17	3.03	4.53	3.77	3.51	.....	.....
3	2.97	4.48	4.58	3.73	3.05	.....	18	3.05	4.50	3.93	3.55	.....	.....
4	2.93	4.49	4.57	3.62	2.97	.....	19	3.11	4.51	4.06	3.62	.....	.....
5	2.97	4.50	4.47	3.59	2.92	.....	20	3.08	4.51	4.11	3.65	.....	.....
6	2.95	4.52	4.42	3.59	2.87	.....	21	3.35	4.50	4.09	3.55	.....	.....
7	2.96	4.50	4.53	3.35	2.87	.....	22	3.41	4.50	4.12	3.44	.....	.....
8	2.96	4.58	4.55	3.19	2.88	.....	23	3.42	4.48	4.16	3.41	.....	.....
9	2.93	4.45	4.56	3.17	2.89	.....	24	3.52	4.44	4.14	3.33	.....	.....
10	2.94	4.46	4.58	3.17	2.90	.....	25	3.67	4.47	4.14	3.16	1.36	.....
11	2.93	4.47	4.57	2.97	2.89	.....	26	3.70	4.50	3.94	3.10	2.71	.....
12	2.94	4.49	4.57	3.17	2.89	.....	27	3.73	4.50	3.79	.....	2.70	.....
13	2.98	4.49	4.56	3.31	2.89	.....	28	3.78	4.51	3.51	.....	2.72	.....
14	3.12	4.54	4.59	3.31	2.88	.....	29	3.86	4.54	3.51	3.18	2.73	.....
15	3.07	4.61	4.23	3.40	.....	.....	30	3.86	4.58	3.53	3.15	2.73	.....
							31	4.00	.....	3.67	3.20	.....	.....

Daily discharge, in second-feet, of South Side Minidoka canal near Minidoka, Idaho, for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.	Oct.
1	181	435	480	340	248	196	16	235	464	230	298	0	.....
2	173	462	482	335	240	196	17	235	471	340	300	0	.....
3	227	462	480	334	238	.....	18	238	466	366	306	0	.....
4	222	464	479	317	227	.....	19	245	468	388	317	0	.....
5	227	466	461	312	221	.....	20	241	468	397	322	0	.....
6	224	470	452	312	214	.....	21	278	466	393	306	0	.....
7	225	466	471	278	214	.....	22	286	466	398	291	0	.....
8	225	480	475	256	216	.....	23	288	462	405	286	0	.....
9	222	457	477	253	217	.....	24	302	455	402	275	0	.....
10	223	459	480	253	218	.....	25	324	461	402	252	62	.....
11	222	461	479	227	217	.....	26	329	466	368	244	195	.....
12	223	464	479	253	217	.....	27	334	466	343	247	194	.....
13	228	464	477	272	217	.....	28	342	468	300	251	196	.....
14	247	473	482	272	216	.....	29	355	473	300	254	198	.....
15	240	486	417	285	0	.....	30	355	480	304	250	198	.....
							31	378	.....	324	257	.....	.....

NOTE.—Daily discharge determined from a rating curve well defined above 230 second-feet, and only fairly well defined below that stage.

Monthly discharge of South Side of Minidoka canal near Minidoka, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May	378	173	260	16,000	B.
June	486	435	466	27,700	A.
July	482	230	411	25,300	A.
August	340	227	282	17,300	A.
September	248	0	139	8,270	C.

SNAKE RIVER AT MILNER, IDAHO.

This station, which is located at Milner, Idaho, in sec. 29, T. 10 S., R. 21 E. Boise meridian, below the diversion dam of the Twin Falls canals, was established May 10, 1909, in cooperation with the Twin Falls North Side Land & Water Co. and the Twin Falls Canal Co.,

to determine the amount of water wasting over the Milner dam and available for use for irrigation and power development below. In connection with the records obtained at the stations on the Twin Falls canals the records show the total amount of water available above the Milner dam.

No important tributaries enter the river between this station and the Minidoka station above, but a large quantity of spring water enters between this station and Shoshone Falls below.

Water is diverted above the station by two irrigation canals at the Minidoka dam and two irrigation canals at the Twin Falls dam, in addition to all the water diverted in the Idaho Falls irrigation district. The normal low-water flow in dry years is already appropriated above this point and during the month of August the flow has usually been supplemented by stored water from Jackson Lake, Wyo.

The original gage was located on the right bank about 100 yards above the cable from which discharge measurements are made. A new gage in two sections was established October 20, 1909, on the left bank at the cable and has been used since October 21, 1909. It was set to read the same as the old gage on the date of establishment. During the irrigating season of 1910 a temporary station was maintained about 100 yards below the regular station.

Owing to unfavorable conditions for measuring, the records at this station can be considered only fair. The rating curve developed for the regular station and based on measurements made during 1909 to 1911 has been applied to gage heights previous to October 21, 1909, although it is not strictly applicable to those heights.

Discharge measurements of Snake River at Milner, Idaho, in 1909–1911.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1909.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 4	La Rue and Stoner	359	4,280	12.2	3,480
13	H. L. Stoner	360	4,530	12.9	5,470
21	do	360	4,370	12.5	4,250
30	do	359	4,340	12.4	5,080
Sept. 6	do	359	4,890	13.9	7,280
12	do	359	5,000	14.2	9,220
Oct. 19	E. S. Fuller	352	5,010	14.15	8,910
Nov. 26	O. W. Hartwell	343	4,620	14.38	6,370
1910.					
Mar. 18	G. C. Baldwin	386	5,130	14.45	12,000
24	La Rue and Porter	380	5,380	14.93	13,700
25	E. A. Porter	384	5,520	15.25	15,500
26	do	385	5,540	15.34	16,000
27	do	386	5,640	15.56	16,700
28	do	383	5,580	15.38	16,400
29	do	382	5,500	15.20	14,700
30	do	380	5,510	15.25	15,800
July 2[a]	Porter and Stoner	16	67	2.55	45
5[a]	E. A. Porter	16	64	2.40	40
7[a]	do	18	74	3.04	67
Aug. 20[a]	La Rue and Sheley	16	75	2.35	37
23[a]	Lynn Crandall	18	79	2.34	34
30[a]	H. W. Sheley	16	78	2.49	43

[a] Measurement made at temporary station. Gage height referred to temporary gage.

Discharge measurements of Snake River at Milner, Idaho, in 1909–1911—Continued.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1911.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 19	Lynn Crandall	360	4,530	12.62	4,370
May 27	J. C. Dort	357	5,430	15.10	13,800
June 13	H. L. Stoner	380	6,150	17.00	19,800
20	J. C. Dort	400	6,570	18.10	32,000
July 10	H. L. Stoner	360	5,080	13.8	8,500
28[a]	do	14	78	3.02	63
Aug. 14[a]	Hartwell and Martin	16	75	3.02	67
19[a]	H. L. Stoner	14	71	2.55	41
Sept. 3[a]	O. W. Hartwell	15	68	2.62	49
Oct. 2[b]	Lynn Crandall	50	172	6.70	505
31	H. L. Stoner	349	4,170	12.35	3,940

[a] Measurement made at temporary station. Gage height referred to temporary gage.
[b] Measurement made from highway bridge. Gage height referred to regular gage.

Daily gage height, in feet, of Snake River at Milner, Idaho, for 1910.

[A. J. Seckner, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	13.1	13.2	15.1	14.9	18.2	15.0	2.79	2.68	2.5	10.1	11.9	13.1
2	13.1	13.1	15.3	14.8	18.2	15.0	2.55	2.6	2.52	10.1	11.5	13.0
3	13.2	13.0	15.3	14.85	18.0	15.4	2.5	2.61	2.49	10.0	11.3	12.65
4	13.2	12.95	15.05	14.85	17.8	15.5	2.5	2.6	2.52	10.65	12.1	12.7
5	13.3	12.9	14.75	14.85	17.1	15.7	2.4	2.6	2.6	12.3	13.0	5.85
6	13.4	12.9	14.6	14.85	16.8	15.7	2.55	2.6	2.57	11.9	13.3	14.25
7	13.4	12.9	14.55	14.85	16.6	15.3	2.95	2.54	2.57	11.6	12.85	13.4
8	13.4	12.85	14.5	14.8	16.5	15.0	11.55	2.6	2.62	11.4	12.6	13.15
9	13.0	12.8	14.7	14.7	16.4	14.6	11.20	2.5	2.58	11.0	12.5	12.9
10	12.9	12.8	14.75	14.7	16.1	14.6	12.05	2.55	2.62	11.0	12.5	12.85
11	13.1	12.8	14.7	14.7	16.4	13.0	.....	2.5	2.58	11.3	12.45	12.8
12	13.3	13.05	14.6	14.8	16.6	13.0	5.35	2.5	2.64	11.5	12.45	12.7
13	13.4	13.1	14.55	14.7	16.9	12.5	5.4	2.5	2.66	11.85	12.6	12.8
14	13.3	13.1	14.55	15.3	16.9	11.8	3.9	2.45	2.7	11.7	4.55	12.85
15	13.3	13.0	14.55	15.7	18.0	11.95	4.05	2.42	2.65	11.9	12.35	12.85
16	13.3	13.1	14.55	15.85	17.5	11.7	4.42	2.42	2.73	10.2	13.45	12.3
17	13.3	13.1	14.5	16.0	17.3	11.55	3.64	2.42	2.77	10.6	13.45	12.45
18	13.3	13.0	14.5	16.0	17.0	11.1	3.25	2.45	2.85	10.5	12.85	12.45
19	13.0	13.1	14.45	15.8	16.3	10.95	3.2	2.42	9.9	11.2	12.15	12.2
20	13.0	13.0	14.4	15.25	16.1	10.4	3.04	2.41	9.9	12.4	13.0	12.3
21	13.1	12.95	14.4	15.9	15.5	9.6	3.0	2.39	9.9	12.2	11.5	12.2
22	13.15	12.9	14.4	16.0	15.5	11.9	3.0	2.35	9.9	12.1	12.3	12.6
23	13.15	13.0	14.75	16.4	15.1	11.2	2.95	2.35	9.9	12.1	12.9	12.7
24	13.2	13.05	15.05	16.6	14.7	11.1	2.92	2.32	9.9	11.95	13.6	12.6
25	13.3	13.4	15.3	16.6	14.5	10.6	2.9	2.4	9.9	12.0	13.15	12.6
26	13.2	13.4	15.4	16.7	14.6	9.9	2.91	2.48	9.9	11.9	13.35	12.65
27	13.2	13.5	15.55	16.75	14.7	9.1	2.92	2.48	9.9	12.1	13.35	12.75
28	13.25	14.0	15.0	17.1	15.1	4.0	2.82	2.42	9.85	12.1	13.3	12.5
29	13.3	.....	15.2	17.2	15.3	3.75	2.86	2.5	9.8	12.0	13.3	12.5
30	13.15	.....	15.2	17.7	15.3	3.5	2.73	2.5	9.8	12.05	13.2	12.6
31	13.25	.....	15.0	.....	15.1	.....	2.7	2.5	.....	11.9	.....	12.6

NOTE.—Gage heights July 1 to 7 and July 12 to Sept. 18, referred to temporary gage below the cable. Flash boards were put on spillway of Milner dam June 28. The high stages of July 8 to 10 were caused by the failure of Jackson Lake dam on July 5. Low readings Nov. 14 and Dec. 5 were caused by the closing of spillway gates.

Daily discharge, in second-feet, of Snake River at Milner, Idaho, for 1909–10.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.								
1	.....	34,500	35,700	5,570	9,060	8,000	7,060	10,400
2	.....	31,400	36,400	4,610	7,240	6,220	7,240	10,400
3	.....	29,500	36,400	4,090	.....	5,210	7,240	10,900
4	.....	28,900	37,600	3,550	.....	5,340	7,420	9,500
5	.....	30,200	37,600	3,710	.....	5,480	7,610	9,950

Daily discharge, in second-feet, of Snake River at Milner, Idaho, for 1909–10—Contd.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.								
6	.....	33,300	35,700	5,510	8,620	9,060	9,500	9,500
7	.....	35,700	36,400	5,950	.....	8,840	9,500	8,620
8	.....	37,600	37,600	5,980	.....	8,620	9,500	8,000
9	.....	39,500	37,000	5,890	.....	8,000	9,500	8,000
10	13,900	40,700	31,400	5,710	.....	7,420	9,500	7,420
11	14,400	43,800	23,200	5,480	.....	7,420	9,500	8,840
12	16,900	44,400	22,300	5,480	9,950	7,240	9,280	8,620
13	18,000	43,800	18,300	5,210	.....	7,240	9,060	8,620
14	17,800	37,600	16,600	5,260	.....	7,610	8,620	8,620
15	17,200	33,900	15,500	7,130	.....	8,000	8,000	8,620
16	13,900	30,200	12,900	5,920	.....	8,620	8,200	8,620
17	16,000	30,800	12,400	5,800	.....	10,900	7,800	8,620
18	15,800	30,800	10,200	5,680	.....	9,950	8,000	7,800
19	16,400	32,000	10,800	5,370	.....	9,640	8,200	7,060
20	16,100	33,900	8,620	5,180	.....	9,280	9,060	6,710
21	14,400	37,600	9,500	4,220	.....	9,060	8,620	6,710
22	14,200	38,800	8,620	4,260	9,280	8,840	8,200	6,070
23	16,600	40,100	7,720	4,130	9,280	8,620	8,200	5,770
24	17,200	40,700	7,170	4,310	9,280	8,200	8,620	5,770
25	20,600	41,000	6,710	4,470	9,060	8,000	10,400	5,770
26	22,300	40,700	6,880	4,000	7,610	8,000	10,900	6,070
27	22,900	39,500	6,540	6,310	6,710	8,000	12,100	6,070
28	22,900	38,200	6,070	8,620	6,320	8,000	11,800	6,070
29	23,500	37,000	5,920	5,480	5,920	7,240	11,800	5,770
30	29,500	35,700	6,160	3,610	6,220	5,920	10,200	5,770
31	31,400	.....	6,710	3,420	.....	6,880	.....	5,770

NOTE.—Daily discharge determined from a rating curve fairly well defined above 3,000 second-feet, constructed from discharge measurements made during 1909 to 1911. This curve is not strictly applicable to gage heights previous to Oct. 21, 1909, as the gage was relocated on that date.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	5,770	6,070	14,400	13,400	32,600	13,900	55	50	43	1,370	3,080	5,770
2	5,770	5,770	15,500	12,900	32,600	13,900	45	47	44	1,370	2,500	5,480
3	6,070	5,480	15,500	13,100	31,400	16,100	43	47	43	1,320	2,260	4,590
4	6,070	5,340	14,200	13,100	30,200	16,600	43	47	44	1,660	3,420	4,710
5	6,380	5,210	12,600	13,100	25,900	17,800	40	47	47	3,810	5,480	200
6	6,710	5,210	11,800	13,100	24,100	17,800	45	47	46	3,080	6,380	10,200
7	6,710	5,210	11,600	13,100	22,900	15,500	61	45	46	2,630	5,080	6,710
8	6,710	5,080	11,400	12,900	22,300	13,900	2,560	47	48	2,380	4,470	5,920
9	5,480	4,950	12,400	12,400	21,800	11,800	2,150	43	46	1,940	4,240	5,210
10	5,210	4,950	12,600	12,400	20,000	11,800	3,330	45	48	1,940	4,240	5,080
11	5,770	4,950	12,400	12,400	21,800	5,480	1,000	43	46	2,260	4,130	4,950
12	6,380	5,620	11,800	12,900	22,900	5,480	172	43	49	2,500	4,130	4,710
13	6,710	5,770	11,600	12,400	24,700	4,240	175	43	49	3,000	4,470	4,950
14	6,380	5,770	11,600	15,500	24,700	2,920	100	42	51	2,770	150	5,080
15	6,380	5,480	11,600	17,800	31,400	3,160	108	41	49	3,080	3,920	5,080
16	6,380	5,770	11,600	18,600	28,300	2,770	128	41	52	1,420	6,880	3,810
17	6,380	5,770	11,400	19,400	27,100	2,560	89	41	54	1,630	6,880	4,130
18	6,380	5,480	11,400	19,400	25,300	2,040	73	42	57	1,570	5,080	4,130
19	5,480	5,770	11,100	18,300	21,200	1,900	71	41	1,270	2,150	3,520	3,810
20	5,480	5,480	10,900	15,200	20,000	1,520	65	40	1,270	4,020	5,480	3,610
21	5,770	5,340	10,900	18,900	16,600	1,140	63	40	1,270	3,610	2,500	3,610
22	5,920	5,210	10,900	19,400	16,600	3,080	63	38	1,270	3,420	3,810	4,470
23	5,920	5,480	12,600	21,800	14,400	2,150	61	38	1,270	3,420	5,210	4,710
24	6,070	5,620	14,200	22,900	12,400	2,040	60	38	1,270	3,160	7,420	4,470
25	6,380	6,710	15,500	22,900	11,400	1,630	59	40	1,270	3,240	5,920	4,470
26	6,070	6,710	16,100	23,500	11,800	1,270	59	42	1,270	3,080	6,540	4,590
27	6,070	7,060	16,900	23,800	12,400	950	60	42	1,270	3,420	6,540	4,830
28	6,220	9,060	13,900	25,900	14,400	120	56	41	1,250	3,420	6,380	4,240
29	6,380	.....	15,000	26,500	15,500	90	57	43	1,220	3,240	6,380	4,240
30	5,920	.....	15,000	29,500	15,500	75	52	43	1,220	3,330	6,070	4,470
31	6,220	.....	13,900	.....	14,400	.....	51	43	.....	3,080	.....	4,470

NOTE.—Daily discharge, except as noted above, determined from a rating curve constructed from discharge measurements made during 1909 to 1911 and fairly well defined above 3,000 second-feet. Daily discharge July 1 to 7 and July 12 to Sept. 18 determined from a rating curve constructed from measurements referred to the temporary gage; curve is well defined below 71 second-feet and roughly approximate above. Discharge June 28 to 30, July 11, Nov. 14, and Dec. 5 estimated.

Monthly discharge of Snake River at Milner, Idaho, for 1909–10.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1909.					
May 10–31	31,400	13,900	18,700	816,000	B.
June	44,400	28,900	36,400	2,170,000	B.
July	37,600	5,920	19,100	1,170,000	B.
August	8,620	3,420	5,160	317,000	B.
October	10,900	5,210	7,900	486,000	B.
November	12,100	7,060	9,020	537,000	B.
December	10,900	5,770	7,760	477,000	B.
1910.					
January	6,710	5,210	6,110	376,000	B.
February	9,060	4,950	5,730	318,000	B.
March	16,900	10,900	13,000	799,000	B.
April	29,500	12,400	17,600	1,050,000	B.
May	32,600	11,400	21,500	1,320,000	B.
June	17,800	75	6,460	384,000	B.
July	3,330	40	355	21,800	B.
August	50	38	42.9	2,640	B.
September	1,270	43	533	31,700	B.
October	4,020	1,320	2,660	164,000	B.
November	7,420	150	4,750	283,000	B.
December	10,200	200	4,730	291,000	B.
The year	32,600	38	6,960	5,040,000	

NORTH SIDE TWIN FALLS CANAL AT MILNER, IDAHO.

This station, which is located in sec. 20, T. 10 S., R. 21 E. Boise meridian, at a highway bridge across the canal about three-fourths of a mile below the head gates at the Milner dam, was established May 10, 1909, to determine the total amount of water diverted by the North Side canal for irrigation in the North Side Twin Falls tract.

The vertical staff gage is on the downstream side of the bridge. Discharge measurements are made from the upstream side. During the winter of 1909–10 the canal was lined with concrete from the head gates to a point some distance below the gaging station.

The flow is regulated at the head gates on the Milner dam. The relation between gage height and discharge is not affected by ice or by change in control below, but is affected by the growth of moss in the concrete-lined section during the summer and fall. A sufficient number of measurements were made during 1910 to determine the discharge with a fair degree of accuracy.

The gage datum has not been changed since the station was established.

The station is maintained in cooperation with the Twin Falls North Side Land & Water Co.

Discharge measurements of North Side Twin Falls canal at Milner, Idaho, in 1910.

Date.		Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
			Feet.	*Sq. ft.*	*Feet.*	*Sec. ft.*
July	1	E. A. Porter	75	390	5.50	1,640
	2[a]	H. L. Stoner	79	373	5.25	1,500
	3	E. A. Porter	78	358	5.05	1,430
	4	do	78	355	4.85	1,410
	5	do	66	302	4.15	1,090
	7	do	82	460	6.15	1,920
	8	do	84	479	6.35	2,050
	9	do	84	499	6.60	2,100
	10	do	85	526	6.90	2,210
	11	do	83	508	6.70	2,150
	11	do	84	522	6.85	2,180
	11	do	85	526	6.90	2,280
	12	do	85	538	7.05	2,290
	13	do	85	536	7.05	2,260
	14	do	84	516	6.80	2,120
	16	do	85	530	7.00	2,300
	18	do	85	520	6.85	2,110
	20	do	83	467	6.20	1,780
	20	do	80	395	5.40	1,360
Aug.	1	do			5.05	1,080
	3	do			4.90	1,060
	4	do			4.85	1,010
	5	do			4.55	873
	8	do			4.15	759
	9	do			4.10	732
	10	do			4.05	720
	11	do			3.95	679
	16	do			2.35	266
	17	do			2.40	267
	18	do			3.90	698
	20[a]	La Rue and Sheley	73	222	3.14	437
	21[a]	Crandall and Sheley	71	195	2.70	330
	21	E. A. Porter			2.70	344
	22	do			2.74	360
	22[a]	H. W. Sheley	71	195	2.7	344
	23[a]	do	71	191	2.65	338
	23[a]	Lynn Crandall	72	192	2.65	336
	24[a]	H. W. Sheley	70	177	2.45	284
	25[a]	do	71	221	3.13	426
	25[a]	do	71	221	3.13	420
	27[a]	do	71	227	3.23	448
	28[a]	do	72	238	3.35	482
	29[a]	do	74	239	3.30	485
	30[a]	do	74	243	3.35	485
	31[a]	do	74	254	3.51	547
Oct.	1	E. A. Porter		287	3.95	700
Nov.	16	do		290	4.00	756
	20	do		207	2.85	464
	28	do		81	1.05	130
Dec.	29	do		188	2.60	502

[a] Measurement made by United States Geological Survey. Other measurements were made by engineers of the Twin Falls North Side Land & Water Co.

Daily gage height, in feet, of North Side Twin Falls canal at Milner, Idaho, for 1910.

[A. J. Seckner, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		4.35	5.4	5.05	5.1	3.55	5.55	3.9	2.0
2		4.35	5.55	5.05	5.0	3.65	4.1	3.5	2.0
3		4.3	5.55	4.9	4.8	3.65	4.1	3.3	2.7
4		4.25	5.6	4.65	4.6	3.65	4.0	3.45	2.75
5		4.1	5.65	4.2	4.5	3.7	4.1	3.5	1.15
6		4.2	5.65	5.3	4.4	3.7	4.8	3.5	2.7
7		4.3	5.65	6.3	4.2	3.7	4.5	3.3	2.9
8		4.25	5.7	6.2	4.1	3.8	4.4	3.5	2.3
9		4.2	5.7	6.85	4.1	3.75	4.5	3.5	2.5
10	1.3	4.9	5.7	6.9	4.0	3.9	4.2	3.8	2.9

Daily gage height, in feet, of North Side Twin Falls canal at Milner, Idaho for 1910—Con.

Day.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
11	2.1	5.1	5.9	6.75	4.0	4.0	.....	3.8	2.8
12	2.7	5.3	6.1	6.95	3.9	4.5	1.6	3.85	3.0
13	2.7	5.5	6.25	7.0	3.85	4.6	2.65	3.9	2.0
14	3.9	5.5	6.25	6.65	3.7	4.9	2.3	4.0	2.0
15	3.7	3.85	6.2	6.9	2.4	5.1	2.3	3.9	2.4
16	3.9	4.35	6.1	6.95	2.4	4.9	5.1	3.95	2.4
17	2.45	4.35	6.05	6.95	3.9	5.35	3.9	3.85	2.8
18	2.4	4.4	5.8	6.8	3.3	5.4	4.2	3.8	2.8
19	2.35	4.35	6.15	6.45	3.3	5.4	3.65	3.5	.....
20	2.25	5.0	6.0	5.4	2.9	5.4	3.7	2.1	.....
21	3.2	5.0	6 1	6.35	2.7	5.4	3.6	.....	.....
22	3.9	5.5	6.1	5.75	2.7	5.4	3.5	.....	.....
23	4.4	4.95	5.95	5.95	2.65	5.4	3.4	2.0	1.1
24	4.1	5.1	6.1	6.0	2.4	5.4	3.4	1.75	1.1
25	4.2	5.15	6.25	6.0	3.1	5.4	3.4	1.05	1.1
26	4.2	5.2	6.0	5.75	3.05	5.35	3.35	1.05	2.4
27	4.2	5.35	6.1	5.8	3.3	5.4	3.4	1.0	2.4
28	4.3	5.45	5.95	5.6	3.3	5.45	3.4	1.05	2.6
29	4.3	5.4	5.75	5.5	3.3	5.4	3.4	1.05	2.6
30	4.3	5.4	5.7	5.0	3.3	3.8	3.4	.....	1.6
31	.....	5.4	.....	5.1	3.5	.....	3.4	.....	1.3

NOTE.—Head gates closed on days for which no gage height is given, October to December. Relation of gage height to discharge affected by backwater caused by growth of moss from about the middle of July to the latter part of November.

Daily discharge, in second-feet, of North Side Twin Falls canal at Milner, Idaho, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,140	1,580	1,430	1,120	552	1,310	718	346
2	.....	1,140	1,640	1,430	1,080	582	737	582	346
3	.....	1,120	1,640	1,370	1,000	582	737	522	538
4	.....	1,100	1,660	1,260	924	582	700	566	553
5	.....	1,040	1,690	1,080	886	597	737	582	151
6	.....	1,080	1,690	1,540	848	597	1,000	582	538
7	.....	1,120	1,690	1,970	774	597	886	522	600
8	.....	1,100	1,710	1,930	737	630	848	582	425
9	.....	1,080	1,710	2,220	737	614	886	582	480
10	181	1,370	1,710	2,240	700	664	774	682	600
11	372	1,450	1,800	2,170	700	700	0	682	568
12	538	1,540	1,880	2,260	664	886	140	700	633
13	538	1,620	1,950	2,280	647	924	322	718	346
14	961	1,620	1,950	2,090	597	1,040	253	756	346
15	885	942	1,930	2,170	272	1,120	253	718	452
16	961	1,140	1,880	2,160	272	1,040	1,120	737	452
17	466	1,140	1,860	2,130	664	1,220	664	728	568
18	452	1,160	1,750	2,030	480	1,240	774	733	568
19	438	1,140	1,910	1,840	480	1,240	582	650	0
20	412	1,410	1,840	1,360	376	1,240	597	270	0
21	702	1,410	1,880	1,750	332	1,240	614	0	0
22	961	1,620	1,880	1,490	332	1,240	582	0	0
23	1,160	1,390	1,820	1,560	322	1,240	552	346	141
24	1,040	1,450	1,880	1,570	272	1,240	552	284	141
25	1,080	1,470	1,950	1,570	426	1,240	552	132	141
26	1,080	1,490	1,840	1,450	413	1,220	537	132	452
27	1,080	1,560	1,880	1,470	480	1,240	552	122	452
28	1,120	1,600	1,820	1,370	480	1,260	552	132	509
29	1,120	1,580	1,730	1,320	480	1,240	552	132	509
30	1,120	1,580	1,710	1,130	480	630	552	0	248
31	.....	1,580	.....	1,130	537	.....	552	.....	181

NOTE.—Daily discharge determined as follows: Apr. 10 to July 13 and Nov. 23 to Dec. 31, from a rating curve fairly well defined above 120 second-feet and well defined above 1,000 second-feet; Aug. 1 to Oct. 20 from a well-defined rating curve; Oct. 20 to Nov. 16 from a curve fairly well defined; daily discharge for other periods computed by indirect method for shifting channels.

Monthly discharge of North Side Twin Falls canal at Milner, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Apr. 10-30	1,160	181	794	33,100	B.
May	1,620	942	1,330	81,800	A.
June	1,950	1,580	1,800	107,000	A.
July	2,280	1,130	1,700	105,000	B.
August	1,120	272	597	36,700	A.
September	1,260	552	948	56,400	A.
October	1,310	0	628	38,600	B.
November	756	0	463	27,600	B.
December	633	0	364	22,400	B.
The period				509,000	

SOUTH SIDE TWIN FALLS CANAL AT MILNER, IDAHO.

This station, which is located in sec. 29, T. 10 S., R. 21 E. Boise meridian, at a point near the Oregon Short Line Railroad depot, about one-eighth mile below the canal head gates at the Milner dam, was established May 10, 1909, to determine the total amount of water diverted by the South Side canal for irrigation of the South Side Twin Falls tract.

A vertical staff gage is attached to the downstream side of the bridge. Discharge measurements are made from the top of a covered water pipe on the upstream side of the bridge.

The flow is regulated at the head gates at the Milner dam and is not affected by ice or by change in control below. The channel at the station is a rock cut and is permanent.

No change has been made in the gage datum since the gage was installed.

The station is maintained in cooperation with the Twin Falls Canal Co.

Discharge measurements of South Side Twin Falls canal at Milner, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 24	E. A. Porter	105	254	3.10	387
25	do	105	238	3.00	348
26	do	105	238	3.02	340
27	do	105	249	3.12	382
28	do	105	264	3.25	356
29	do	105	269	3.30	398
30	do	105	300	3.60	533
Apr. 18	G. C. Baldwin	114	422	4.55	780
July 1	E. A. Porter	125	918	8.60	2,610
3	Porter and Stoner	118	843	8.15	2,290
5	E. A. Porter	122	838	8.20	2,400
6	do	124	892	8.55	2,580
9	do	130	993	9.25	3.020
Aug. 11	Lynn Crandall	117	689	7.0	1,750
20[a]	La Rue and Sheley	122	712	7.05	1,680
20	Crandall and Sheley	122	720	7.09	1,790
22	do	120	713	6.94	1,690
22	Lynn Crandall	116	704	6.92	1,730
23	H. W. Sheley	120	700	6.78	1,630
23	Lynn Crandall	116	693	6.80	1,700
24	do	116	693	6.90	1,740
25	H. W. Sheley	122	734	7.10	1,780
27	do	122	740	7.14	1,780
28	do	124	788	7.52	2,000
30	do	122	780	7.48	1,950

[a] Moss affected running of meter.

Daily gage height, in feet, of South Side Twin Falls canal at Milner, Idaho, for 1910.

[A. J. Seckner, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.1	4.35	3.2	3.8	6.1	8.5	8.5	7.0	7.55	5.35	3.95	3.9
2	4.1	4.3	3.2	4.15	6.7	8.65	8.2	7.0	7.55	4.65	3.7	3.85
3	4.1	4.2	2.7	4.15	6.7	8.8	8.1	7.0	7.5	4.8	3.9	3.9
4	4.1	4.1	2.7	4.15	6.95	8.9	8.1	7.0	7.5	5.0	3.85	4.1
5	4.1	4.1	2.7	4.15	6.95	9.0	8.15	6.95	7.5	4.75	3.7	4.2
6	4.1	4.1	1.7	3.9	6.9	9.0	8.5	7.0	7.5	4.65	4.9	4.1
7	4.0	4.1	1.7	3.9	6.9	8.9	9.0	7.0	7.5	4.2	5.2	4.2
8	4.1	4.1	1.7	3.95	6.95	8.9	9.1	7.0	7.5	4.25	5.0	3.9
9	4.1	4.1	1.7	4.15	7.0	8.9	9.3	7.0	7.45	3.75	5.0	4.1
10	4.2	4.1	1.7	4.15	7.25	8.9	9.2	7.0	7.55	4.0	5.05	4.1
11	4.2	4.2	2.55	4.15	7.4	8.9	9.2	7.05	7.45	4.0	4.8	4.0
12	4.1	4.2	2.5	4.15	7.1	9.0	9.25	7.1	7.4	4.0	4.0	4.05
13	4.1	4.2	2.5	4.3	7.4	8.95	9.1	7.1	7.2	3.95	4.0	4.0
14	4.1	4.2	2.5	4.5	7.5	8.95	8.35	6.9	7.1	3.95	3.65	4.0
15	4.1	4.1	2.5	4.5	7.6	9.05	8.5	7.0	6.9	4.0	3.5	4.0
16	4.1	4.45	2.5	4.55	7.5	9.0	9.0	7.1	6.55	3.95	4.2	4.1
17	4.1	4.45	2.5	4.6	7.55	8.9	9.0	7.1	6.35	3.95	4.2	4.1
18	4.1	4.4	2.5	4.55	7.5	8.9	9.0	7.1	5.25	3.9	5.05	4.05
19	4.2	4.4	2.5	4.5	7.6	8.9	8.5	7.2	5.35	4.0	5.05	.....
20	4.3	4.35	3.0	4.8	7.8	8.85	8.4	7.05	5.55	4.0	4.0	4.4
21	4.35	4.3	3.0	5.25	7.85	8.9	8.15	7.0	5.55	3.75	3.15	4.4
22	4.4	4.3	3.0	5.55	7.9	8.9	7.8	6.95	5.3	3.9	3.6	4.5
23	4.4	4.3	3.05	5.55	7.8	9.0	7.75	6.8	5.3	3.85	4.4	4.5
24	3.9	3.7	3.1	5.7	7.9	9.0	7.6	7.0	5.4	3.9	4.8	4.1
25	4.2	2.25	3.0	5.0	8.15	8.95	7.5	7.1	5.4	3.85	4.65	4.1
26	4.25	2.95	3.0	5.25	8.15	8.95	7.35	7.0	5.4	3.95	4.6	4.1
27	4.3	3.2	3.35	6.2	8.5	9.0	7.35	7.25	5.45	3.95	4.3	3.9
28	4.45	3.2	3.35	4.2	8.5	9.0	7.3	7.55	5.4	3.95	4.1	3.9
29	4.4	.....	3.35	6.8	8.45	8.85	7.3	7.5	5.4	3.95	3.95	4.1
30	4.4	.....	3.6	6.75	8.4	8.8	8.15	7.5	5.3	3.95	3.95	3.6
31	4.35	.....	3.6	.....	8.4	.....	8.0	7.5	.....	3.95	.....	3.7

Daily discharge, in second-feet, of South Side Twin Falls canal at Milner, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	630	705	385	540	1,340	2,540	2,540	1,740	2,010	1,040	585	570
2	630	690	385	645	1,600	2,630	2,360	1,740	2,010	798	510	555
3	630	660	265	645	1,600	2,720	2,300	1,740	1,980	850	570	570
4	630	630	265	645	1,710	2,780	2,300	1,740	1,980	920	555	630
5	630	630	265	645	1,710	2,850	2,330	1,710	1,980	832	510	660
6	630	630	105	570	1,690	2,850	2,540	1,740	1,980	798	885	630
7	600	630	105	570	1,690	2,780	2,850	1,740	1,980	660	990	660
8	630	630	105	585	1,710	2,780	2,920	1,740	1,980	675	920	570
9	630	630	105	645	1,740	2,780	3,040	1,740	1,960	525	920	630
10	660	630	105	645	1,860	2,780	2,980	1,740	2,010	600	938	630
11	660	660	235	645	1,940	2,780	2,980	1,760	1,960	600	850	600
12	630	660	225	645	1,780	2,850	3,010	1,780	1,940	600	600	615
13	630	660	225	690	1,940	2,820	2,920	1,780	1,840	585	600	600
14	630	630	225	750	1,980	2,820	2,450	1,690	1,780	585	498	600
15	630	630	225	750	2,040	2,880	2,540	1,740	1,690	600	460	600
16	630	735	225	765	1,980	2,850	2,850	1,780	1,530	585	660	630
17	630	735	225	780	2,010	2,780	2,850	1,780	1,440	585	660	630
18	630	720	225	765	1,980	2,780	2,850	1,780	1,010	570	938	615
19	660	720	225	750	2,040	2,780	2,540	1,840	1,040	600	938	668
20	690	705	335	850	2,140	2,750	2,480	1,760	1,120	600	600	720
21	705	690	335	1,010	2,170	2,780	2,330	1,740	1,120	525	372	720
22	720	690	335	1,120	2,200	2,780	2,140	1,710	1,020	570	485	750
23	720	690	348	1,120	2,140	2,850	2,110	1,640	1,020	555	720	750
24	570	510	360	1,180	2,200	2,850	2,040	1,740	1,060	570	850	630
25	660	178	335	920	2,330	2,820	1,980	1,780	1,060	555	798	630
26	675	322	335	1,010	2,330	2,820	1,910	1,740	1,060	585	780	630
27	690	385	422	1,380	2,540	2,850	1,910	1,860	1,080	585	690	570
28	735	385	422	660	2,540	2,850	1,880	2,010	1,060	585	630	570
29	720	.....	422	1,640	2,510	2,750	1,880	1,980	1,060	585	585	630
30	720	.....	485	1,620	2,480	2,720	2,330	1,980	1,020	585	585	485
31	705	.....	485	.....	2,480	.....	2,250	1,980	.....	585	.....	510

NOTE.—Daily discharge determined from a rating curve well defined above 300 second-feet.

Monthly discharge of South Side Twin Falls canal at Milner, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	735	570	656	40,300	A.
February	735	178	614	34,100	A.
March	485	105	282	17,300	B.
April	1,640	540	840	50,000	A.
May	2,540	1,340	2,010	124,000	A.
June	2,880	2,540	2,790	166,000	A.
July	3,040	1,880	2,460	151,000	A.
August	2,010	1,640	1,780	109,000	A.
September	2,010	1,010	1,530	91,000	A.
October	1,040	525	642	39,500	A.
November	990	372	689	41,000	A.
December	750	485	621	38,200	A.
The year	3,040	105	1,250	901,000	

SNAKE RIVER AT KING HILL, IDAHO.

This station, which is located in sec. 7, T. 5 S., R. 11 E., Boise meridian, near the Oregon Short Line Railroad depot in the village of King Hill, Idaho, and below Twin Falls and Shoshone Falls, was established May 13, 1909, to determine the total flow of Snake River available for irrigation and power below Big Wood River, including the return water from the Minidoka and Twin Falls irrigation tracts.

A very large quantity of spring water enters the river between this station and Milner. In addition only two important tributaries enter within this section—Salmon Falls River, which joins the Snake about 30 miles above King Hill, and Big Wood River, which comes in about 20 miles above King Hill. Bruneau River is tributary to the Snake about 40 miles below the station.

The total normal low-water flow of Snake River is diverted above this station for use in the Minidoka and Twin Falls irrigation tracts. During dry years practically the total flow during the irrigating season will be derived from return water from these tracts and the flow of springs in the canyon.

The original gage was a vertical staff attached to the left pier of a suspension footbridge. The bridge and gage were destroyed by a flood on March 1, 1910. A temporary gage was established March 7 on Fricke's water wheel about three-fourths mile upstream. On August 17, 1910, a cable and inclined staff gage were installed at the former site of the foot-bridge. The new gage is on the right bank and its datum is 2.2 feet lower than that of the original gage. By means of comparative readings the heights read on the temporary gage have been reduced to the datum of the inclined gage.

The gage heights are not affected by ice or by artificial control below, but some irregularity of flow is caused by the operation of the gates on the Milner dam.

Discharge measurements of Snake River at King Hill, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 6	Hartwell and Purton	374	2,910	[a] 4.80	9,970
Aug. 17	Lynn Crandall	300	2,200	4.63	4,990
Sept. 4	do	305	2,230	4.72	5,060
29	O. W. Hartwell	315	2,510	5.66	7,180
Oct. 12	Lynn Crandall	320	2,630	5.99	7,890
Nov. 10	do	380	2,970	6.82	10,100

[a] Gage height referred to original gage.

Comparative gage heights, in feet, on temporary and permanent gages on Snake River at King Hill, Idaho, during 1910-11.

Date.	Temporary gage.	Permanent gage.	Date.	Temporary gage.	Permanent gage.
1910.			1911.		
Sept. 4	—0.50	4.72	Jan. 22	1.80	6.72
Oct. 1	.40	5.50	29	3.72	8.58
2	.40	5.50	Feb. 5	4.30	9.13
9	1.05	6.17	19	2.01	6.93
12	.87	6.00	26	1.58	6.51
16	1.22	6.32	Mar. 5	2.70	7.55
23	1.51	6.51	12	3.30	8.13
30	1.45	6.47	12	3.32	8.12
Nov. 6	3.00	7.80	19	2.90	7.75
10	1.87	6.82	26	2.50	7.40
13	1.85	6.81	Apr. 2	2.15	7.02
20	1.65	6.50	9	3.05	7.90
27	2.70	7.60	16	2.12	7.00
Dec. 5	2.01	6.90	23	1.90	6.86
11	2.50	7.37	30	3.00	7.80
18	1.70	6.70	May 7	3.70	8.63
			14	5.15	9.70
1911.			21	5.40	9.90
Jan. 1	1.70	6.65	28	5.65	10.18
8	1.33	6.34	June 4	5.90	10.40
15	1.81	6.77	11	7.60	12.21

Daily gage height, in feet, of Snake River at King Hill, Idaho, for 1910.

[Temporary gage.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		5.5	8.5	4.9	—0.1	—0.6	—0.5			
2		5.5	9.0	4.4	—.3	—.5	—.55	0.4		
3		5.6	9.0	5.0	—.4	—.6	—.5			
4		4.8	8.9	5.2	—.6	—.6	—.5			
5		5.3	8.5	5.3	—.6	—.6	—.5			2.01
6		5.2	7.8	5.6	—.6	—.6	—.5		3.0	
7	4.8	5.2	7.5	5.4	—.7	—.6	—.5			
8	4.7	5.3	7.3	4.8	—.7	—.6	—.5			
9	4.7	4.8	7.0	4.4	—.7	—.6	—.5	1.05		
10	4.8	4.7	6.8	4.3	.8	—.6	—.45			
11	4.8	4.7	6.8	3.0	1.2	—.6	—.45			2.5
12	4.7	4.8	6.7	2.7	.4	—.6	—.45			
13	4.7	5.0	7.0	2.3	.0	—.6	—.4		1.85	
14	4.6	5.4	7.5	2.0	—.3	—.6	—.4			
15	4.6	6.0	7.8	1.7	—.3	—.7	—.35			
16	4.6	6.3	8.5	1.8	—.3	—.7	—.3	1.22		
17	4.6	6.6	8.0	1.0	—.4	—.6	—.15			
18	4.6	6.7	7.6	.8	—.4	—.6	—.15			1.7
19	4.6	6.7	7.0	.6	—.4	—.6	—.2			
20	4.8	6.4	6.5	.6	—.5	—.6	—.25		1.65	

Daily gage height, in feet, of Snake River at King Hill, Idaho, for 1910—Continued.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	5.4	6.0	5.7	0.5	−0.5	−0.6	−0.3	.....	.....	.....
22	5.6	5.8	5.5	.4	−.55	−.6	.15	.....	.....	.....
23	5.7	6.8	5.1	.9	−.6	−.6	.5	1.51	.....	.....
24	5.8	7.2	4.8	1.0	−.5	−.6	.5	.....	.....	.....
25	6.5	7.4	4.4	.9	−.45	−.6	.6	.....	.....	1.98
26	6.6	7.5	4.2	.5	−.5	−.65	.6	.....	.....	.....
27	6.7	7.4	4.2	.5	−.5	−.7	.6	.....	2.7	.....
28	6.7	7.5	4.2	.2	−.6	−.65	.55	.....	.....	.....
29	6.0	8.0	4.5	−.1	−.6	−.6	.5	.....	.....	.....
30	5.0	7.9	5.0	−.1	−.6	−.55	.5	1.45	.....	.....
31	5.2	.....	5.0	.....	−.6	−.5	.....	.....	.....	.....

Daily gage height, in feet, of Snake River at King Hill, Idaho, for 1910.

[Horace Bruce, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.85	5.10	.....	10.1	12.9	9.55	5.05	4.6	4.70	.....	6.41	7.42
2	4.85	5.00	.....	10.1	13.4	9.1	4.9	4.7	4.70	5.50	6.39	7.20
3	5.00	5.00	.....	10.2	13.4	9.65	4.8	4.6	4.69	5.34	6.18	7.10
4	4.82	4.85	.....	9.45	13.3	9.85	4.6	4.6	4.70	5.70	6.05	7.10
5	4.7	4.8	.....	9.9	12.9	9.9	4.6	4.6	4.72	5.72	6.50	6.90
6	4.5	4.83	.....	9.85	12.25	10.2	4.6	4.6	4.75	6.21	7.80	6.05
7	4.48	4.87	9.45	9.85	12.0	10.0	4.5	4.6	4.73	6.42	7.40	6.00
8	4.7	4.86	9.4	9.9	11.8	9.45	4.5	4.6	4.73	6.23	7.08	8.00
9	4.5	4.75	9.4	9.45	11.5	9.1	4.5	4.6	4.73	6.17	6.90	7.50
10	4.59	4.77	9.45	9.4	11.3	9.0	5.85	4.6	4.73	5.95	6.82	7.20
11	4.65	4.74	9.45	9.4	11.3	7.85	6.25	4.6	4.75	5.90	6.78	7.37
12	4.65	4.79	9.4	9.45	11.2	7.6	5.5	4.6	4.77	6.00	6.79	7.20
13	4.7	4.78	9.4	9.65	11.5	7.2	5.15	4.6	4.80	6.11	6.81	7.07
14	4.67	4.90	9.3	10.0	12.0	6.95	4.9	4.6	4.85	6.30	6.84	7.10
15	4.7	5.00	9.3	10.55	12.25	6.7	4.9	4.5	4.91	6.28	6.40	7.10
16	4.8	5.00	9.3	10.85	12.9	6.75	4.9	4.5	4.98	6.32	5.50	6.98
17	4.7	5.10	9.3	11.1	12.45	6.05	4.8	4.6	5.03	6.18	7.50	6.90
18	5.1	5.10	9.3	11.2	12.05	5.85	4.8	4.64	5.03	5.99	7.58	6.70
19	5.14	5.10	9.3	11.2	11.5	5.7	4.8	4.66	5.03	5.73	6.90	6.70
20	4.95	5.12	9.45	10.95	11.0	5.7	4.7	4.64	4.93	5.80	6.50	6.50
21	5.0	4.90	10.0	10.55	10.3	5.6	4.7	4.64	5.13	6.38	7.00	6.50
22	5.13	5.00	10.2	10.35	10.1	5.5	4.65	4.64	5.37	6.60	6.25	6.52
23	5.2	4.89	10.3	11.3	9.75	5.95	4.6	4.65	5.68	6.51	6.89	6.59
24	5.4	5.00	10.35	11.7	9.45	6.05	4.7	4.62	5.68	6.40	7.30	6.99
25	5.5	5.05	11.0	11.9	9.1	5.95	4.75	4.62	5.69	6.40	7.80	6.88
26	5.5	5.50	11.1	12.0	8.95	5.6	4.7	4.64	5.70	6.42	7.30	6.90
27	5.3	5.48	11.2	11.9	8.95	5.6	4.7	4.64	5.70	6.39	7.60	6.96
28	5.2	7.00	11.2	12.0	8.95	5.35	4.6	4.68	5.70	6.45	7.51	6.95
29	5.2	.....	10.55	12.45	9.2	5.05	4.6	4.70	5.64	6.46	7.55	6.82
30	5.18	.....	9.65	12.35	9.65	5.05	4.6	4.70	5.60	6.47	7.50	6.87
31	5.1	.....	9.85	.....	9.65	.....	4.6	4.70	.....	6.47	.....	6.90

NOTE.—Gage heights Jan. 1 to Feb. 28 refer to the original gage established in 1909. Gage heights Mar. 7 to Aug. 17 are referred to the datum of the gage established Aug. 17, 1910, and were obtained by a curve of relation based on comparative readings of the temporary gage and the permanent gage established Aug. 17. Gage heights after Aug. 17 were read on the gage established that date.

Daily discharge, in second-feet, of Snake River at King Hill, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10,000	10,800	22,000	20,900	31,900	18,900	5,790	4,930	5,110	6,860	8,960	11,800
2	10,000	10,500	23,000	20,900	34,000	17,200	5,490	5,110	5,110	6,750	8,900	11,100
3	10,500	10,500	22,500	21,200	34,000	19,200	5,300	4,930	5,090	6,400	8,360	10,900
4	9,920	10,000	21,000	18,500	33,600	19,900	4,930	4,930	5,110	7,200	8,040	10,900
5	9,540	9,860	20,000	20,100	31,900	20,100	4,930	4,930	5,150	7,250	9,200	10,300
5	8,900	9,960	19,700	19,900	29,300	21,200	4,930	4,930	5,200	8,440	12,900	8,040
7	8,840	10,100	18,500	19,900	28,200	20,500	4,760	4,930	5,170	8,980	11,700	7,910
8	9,540	10,100	18,300	20,100	27,400	18,500	4,760	4,930	5,170	8,490	10,800	13,500
9	8,900	9,700	18,300	18,500	26,200	17,200	4,760	4,930	5,170	8,340	10,300	12,000
10	9,190	9,760	18,500	18,300	25,500	16,900	7,550	4,930	5,170	7,790	10,100	11,100
11	9,380	9,670	18,500	18,300	25,500	13,100	8,540	4,930	5,200	7,670	10,000	11,600
12	9,380	9,830	18,300	18,500	25,100	12,300	6,750	4,930	5,240	7,910	10,000	11,100
13	9,540	9,800	18,300	19,200	26,200	11,100	6,000	4,930	5,300	8,180	10,000	10,800
14	9,440	10,200	18,000	20,500	28,200	10,400	5,490	4,930	5,400	8,670	10,100	10,900
15	9,540	10,500	18,000	22,600	29,300	9,740	5,490	4,760	5,510	8,620	8,930	10,900
16	9,860	10,500	18,000	23,700	31,900	9,880	5,490	4,760	5,650	8,720	6,750	10,500
17	9,540	10,800	18,000	24,700	30,100	8,040	5,300	4,930	5,750	8,360	12,000	10,300
18	10,800	10,800	18,000	25,100	28,500	7,550	5,300	5,000	5,750	7,890	12,200	9,740
19	11,000	10,800	18,000	25,100	26,200	7,200	5,300	5,040	5,750	7,270	10,300	9,740
20	10,300	10,900	18,500	24,100	24,300	7,200	5,110	5,000	5,550	7,430	9,200	9,200
21	10,500	10,200	20,500	22,600	21,600	6,970	5,110	5,000	5,950	8,880	10,600	9,200
22	10,900	10,500	21,200	21,800	20,900	6,750	5,020	5,000	6,460	9,470	8,540	9,250
23	11,200	10,200	21,600	25,500	19,600	7,790	4,930	5,020	7,150	9,230	10,300	9,440
24	11,800	10,500	21,800	27,000	18,500	8,040	5,110	4,970	7,150	8,930	11,400	10,600
25	12,200	10,700	24,300	27,800	17,200	7,790	5,200	4,970	7,180	8,930	12,900	10,200
26	12,200	12,200	24,700	28,200	16,700	6,970	5,110	5,000	7,200	8,980	11,400	10,300
27	11,500	12,100	25,100	27,800	16,700	6,970	5,110	5,000	7,200	8,900	12,300	10,500
28	11,200	17,700	25,100	28,200	16,700	6,420	4,930	5,070	7,200	9,060	12,000	10,400
29	11,200	.....	22,600	30,100	17,600	5,790	4,930	5,110	7,060	9,090	12,200	10,100
30	11,100	.....	19,200	29,700	19,200	5,790	4,930	5,110	6,970	9,120	12,000	10,200
31	10,800	.....	19,900	.....	19,200	.....	4,930	5,110	.....	9,120	.....	10,300

NOTE.—Daily discharge for January and February determined from a rating curve well defined above 10,500 second-feet; discharge Mar. 1 to 6 estimated; discharge for remainder of year determined from a rating curve well defined between limits of stage.

Monthly discharge of Snake River at King Hill, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	12,200	8,840	10,300	633,000	A.
February	17,700	9,670	10,700	594,000	A.
March	25,100	18,000	20,300	1,250,000	B.
April	30,100	18,300	23,000	1,370,000	A.
May	34,000	16,700	25,200	1,550,000	A.
June	21,200	5,790	11,800	702,000	A.
July	8,540	4,760	5,400	332,000	A.
August	5,110	4,760	4,970	306,000	A.
September	7,200	5,090	5,870	349,000	A.
October	9,470	6,400	8,290	510,000	A.
November	12,900	6,750	10,400	619,000	A.
December	13,500	7,910	10,400	640,000	A.
The year	34,000	4,760	12,200	8,860,000	

SNAKE RIVER AT WEISER, IDAHO.

This station, which is located about 200 yards downstream from the wagon bridge at Weiser, in sec. 31, T. 11 N., R. 5 W., Boise meridian, about 1 mile below the mouth of Weiser River, and below Boise, Payette, Bruneau, Owyhee, and Malheur rivers, was established October 8, 1910. The main streams entering between this

station and the station at Lewiston are Burnt, Powder, Imnaha, Salina, Salmon, Grande Ronde and Clearwater rivers.

Records at this point will indicate the amount of water available for power and irrigation in the vicinity of Weiser.

The equipment consists of an inclined gage on the right bank and a car and cable. The United States Weather Bureau has obtained gage heights at a gage situated about one-half mile above the Survey gage for portions of almost every year since 1895.

No discharge measurements were made during 1910.

Daily gage height, in feet, of Snake River at Weiser, Idaho, for 1910.

[A. J. Reeves, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	6.0	7.4	11	5.8	6.7	6.5	21	5.8	6.7	6.5
2	.....	6.0	7.4	12	5.7	6.6	7.3	22	5.7	6.7	6.4
3	.....	6.0	7.2	13	5.6	6.8	7.3	23	5.7	6.7	6.4
4	.....	6.0	8.4	14	5.6	6.7	7.4	24	6.0	7.1	6.4
5	.....	5.9	8.0	15	5.7	6.6	7.1	25	6.0	7.8	6.4
6	.....	5.8	7.4	16	5.7	6.5	6.9	26	6.0	7.2	6.5
7	.....	5.8	7.2	17	5.9	6.4	6.9	27	6.0	7.3	6.6
8	5.7	6.0	7.0	18	6.0	6.1	6.8	28	6.0	7.0	6.5
9	5.9	6.7	6.5	19	6.0	6.3	6.8	29	6.0	7.2	6.5
10	5.9	6.7	6.5	20	5.9	6.8	6.6	30	6.0	7.5	6.6
								31	6.0	.....	6.5

Daily discharge, in second-feet, of Snake River at Weiser, Idaho, for 1910.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	11,300	18,900	11	10,300	15,000	13,900	21	10,300	15,000	13,900
2	.....	11,300	18,900	12	9,780	14,400	18,300	22	9,780	15,000	13,400
3	.....	11,300	17,800	13	9,300	15,500	18,300	23	9,780	15,000	13,400
4	.....	11,300	25,000	14	9,300	15,000	18,900	24	11,300	17,200	13,400
5	.....	10,800	22,500	15	9,780	14,400	17,200	25	11,300	21,300	13,400
6	.....	10,300	18,900	16	9,780	13,900	16,100	26	11,300	17,800	13,900
7	.....	10,300	17,800	17	10,800	13,400	16,100	27	11,300	18,300	14,400
8	9,780	11,300	16,600	18	11,300	11,800	15,500	28	11,300	16,600	13,900
9	10,800	15,000	13,900	19	11,300	12,800	15,500	29	11,300	17,800	13,900
10	10,800	15,000	13,900	20	10,800	15,500	14,400	30	11,300	19,500	14,400
								31	11,300	.....	13,900

NOTE.—Daily discharges were determined from a rating curve well defined by measurements made in 1911.

Monthly discharge of Snake River at Weiser, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
October	11,300	9,300	10,600	505,000	A.
November	21,300	10,300	14,400	857,000	A.
December	25,000	13,400	16,100	990,000	A.

SNAKE RIVER AT LEWISTON, IDAHO.

This station, which is located at the Interior Warehouse Co.'s building about one-half mile above the mouth of Clearwater River and one-quarter mile above the toll bridge between Lewiston and

Clarkston, Wash., was established by the United States Weather Bureau in 1894, but readings were made only at high water periods until April 10, 1904, since which time daily observations have been recorded.

The only important tributaries entering the river below are Tucannon Creek and Palouse River, both of which are almost negligible in proportion to the main stream.

Water is diverted above the station for irrigation on upper Snake River and its tributaries in Idaho and Oregon. The amount of land under irrigation has been increased materially since the continuous records were begun and the effect of the increase is shown in the reduced low-water discharge during the summer.

The gage is in two sections. The lower (inclined) section reads to 8.6 feet; the upper (vertical) section from 8.7 to 28 feet.

Measurements are made from the downstream side of the highway bridge.

At low stages the river is confined to a narrow channel at the extreme western end of the bridge. At medium stages some water runs through a second channel near the Lewiston end, and at high stages the river covers the broad low bar between these channels and extends from shore to shore for a total width of nearly a quarter of a mile. Conditions for making measurements are good but not ideal, and good results may be obtained by careful work. Velocities are swift at all stages in the main channel, and at high stages the current is well distributed throughout the whole width. The channel is probably permanent.

The fall between the gage and the mouth of the Clearwater is slight and the gage readings afford an index of the total discharge below the junction. The discharge of the Clearwater, as determined from the gage readings at Central Ferry, 4 miles above the mouth, has therefore been added to that of the Snake as measured at the bridge in preparing the rating curve. The discharge thus obtained represents practically the total run-off of the Snake River basin, and the records will be almost directly comparable with those obtained at Burbank.

Discharge measurements of Snake River at Lewiston, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.		
					Above Clearwater River.	Clearwater River.	Total.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*
Aug. 15	Allen and Davenport	312	2,210	[a] −0.30	11,800	[b] 2,500	14,300
26	R. W. Davenport	308	2,120	− .61	10,600	2,300	12,900

[a] Weather Bureau observers reading.
[b] Estimated, station not yet established on Clearwater.

Daily gage height, in feet, of Snake River at Lewiston, Idaho, for 1910.

[U. S. Weather Bureau, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	3.0	7.1	9.5	13.4	11.0	3.2	0.6	0.0	0.9	1.4	3.3
2	2.3	2.9	12.0	9.7	12.8	11.1	3.0	.5	.0	.9	1.5	3.3
3	2.1	2.5	15.0	10.0	12.0	10.7	2.9	.4	− .1	.9	1.5	3.3
4	2.0	2.3	15.5	9.9	12.0	10.3	2.7	.3	− .1	1.1	1.5	3.7
5	1.9	2.3	14.6	9.5	12.3	9.9	2.6	.2	− .2	1.5	1.4	4.7
6	1.7	2.3	12.4	9.3	12.2	9.3	2.6	.1	− .3	1.5	1.4	4.2
7	1.5	2.0	11.4	9.4	12.0	9.0	2.6	.0	− .3	1.4	1.2	3.8
8	1.7	1.9	10.5	9.7	12.4	9.0	2.3	.0	− .3	1.5	1.4	3.3
9	2.0	2.1	10.0	10.4	13.0	8.9	2.1	.0	− .4	1.4	2.0	3.0
10	1.9	2.2	9.4	11.2	13.7	8.5	2.1	.0	− .4	1.4	2.7	2.6
11	2.1	2.4	9.5	12.4	14.7	7.8	1.8	.0	− .4	1.6	3.1	3.3
12	2.3	2.4	9.4	13.5	14.3	7.0	1.7	− .1	− .4	1.4	3.7	3.1
13	2.3	2.4	9.8	13.6	13.8	6.8	1.6	− .2	− .4	1.3	3.3	3.1
14	2.3	2.5	10.1	13.0	13.5	7.2	1.5	− .3	− .4	1.2	3.2	2.9
15	2.2	2.5	10.4	12.4	13.1	7.3	1.2	− .4	− .3	1.2	2.9	3.4
16	2.2	2.7	10.8	11.7	12.4	6.5	1.2	− .4	− .2	1.1	2.6	2.9
17	2.5	2.9	11.2	11.4	11.9	6.4	1.2	− .5	+ .2	1.3	2.4	2.6
18	2.6	2.9	11.4	11.5	11.8	6.2	1.5	− .5	.8	1.4	2.3	2.4
19	2.5	2.7	12.6	12.3	11.6	5.8	1.4	− .5	.9	1.7	2.1	2.2
20	2.7	2.5	14.8	13.0	11.4	5.4	1.4	− .3	1.0	1.6	1.8	2.2
21	2.8	2.6	15.6	13.8	10.8	5.1	1.4	− .4	.9	1.6	2.8	2.0
22	2.5	2.5	16.1	13.4	10.4	4.9	1.3	− .4	.8	1.4	3.9	2.0
23	2.7	2.4	16.6	13.2	10.6	4.6	1.3	− .5	.9	1.3	3.3	2.0
24	2.9	2.6	15.2	13.4	10.8	4.5	1.3	− .6	.8	1.2	3.3	1.9
25	3.2	3.2	14.1	14.4	11.2	4.2	1.1	− .7	.7	1.1	3.5	2.0
26	3.6	3.3	12.6	15.3	11.3	3.8	1.0	− .7	.7	1.5	3.0	2.0
27	3.9	5.5	11.6	15.6	10.9	3.7	.9	− .7	.8	1.6	3.2	2.0
28	3.8	5.2	11.0	15.4	11.5	3.7	.8	− .5	.8	1.5	3.1	2.1
29	3.7	.....	10.4	14.8	10.8	3.5	.8	− .5	.9	1.4	2.9	2.0
30	3.3	.....	10.0	14.0	10.4	3.4	.7	− .5	.9	1.5	3.0	2.0
31	3.1	.....	9.6	.....	10.5	.....	.6	− .4	.....	1.4	.....	2.0

SNAKE RIVER AT BURBANK, WASH.

This station was established October 2, 1907, by the Burbank Power & Water Co., which has undertaken to reclaim several thousand acres near Burbank by pumping water from Snake River. Power is developed by a plant utilizing the fall in Fivemile Rapids.

Two gages are maintained: No. 1 is on the right bank 1,500 feet upstream from the intake of the power canal; No. 2 is on the left bank at the tailrace of the power plant 9,200 feet below the upper gage. Both gages are graduated in feet and tenths and read from sea level. In the published gage-height tables, however, the gage datum has been taken as 300 feet above sea level.

Measurements are made from the upstream side of the Northern Pacific Railway (Pendleton branch) bridge about 3 miles below the power house, 3½ miles east of Pasco, one-half mile west of Burbank, Wash., one-fourth mile above the mouth of the river, and 3½ miles below the foot of Fivemile Rapids.

The channel at the measuring section is straight above and below the station. The water is swift at all stages of the stream and will probably be confined within the section limited by the abutments of the railroad bridge. A gage reading to 28 feet is attached to the upstream side of the draw span, but as this gage is affected by backwater from Columbia River the heights thereon will not accurately

indicate the discharge. The conditions at the upper gage are favorable for good results. The observed gage heights are not affected by backwater from Columbia River and will probably be a stable index of the discharge if suitable corrections can be made for artificial control of water at the head gates.

The construction of the wing dam at the head of the power canal in August raised the water at the upper gage a small amount.

The gage in the tailrace is somewhat affected by backwater from the Columbia, so it will be impossible to determine the exact backwater effect from comparison of the two gages.

The gage heights in the tailrace for 1909 and 1910, as well as those above the rapids for 1910, are given herewith.

Discharge measurements of Snake River at Burbank, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 25[a]	H. Kimble	720	11,500	37.2	24,900
Mar. 30	H. D. McGlashan	1,480	18,800	[b] 43.6	130,000
May 10	McGlashan and Ebert	1,530	26,500	45.6	178,000
June 28	H. D. McGlashan	1,460	17,900	38.0	41,500
Sept. 24	F. C. Ebert	663	11,700	35.6	19,400
Oct. 28	Ebert and Storey	711	11,800	36.6	26,100

[a] High wind upstream and shore ice; measurement uncertain.
[b] Gage height estimated from reading at lower end of headrace of power plant; probably correct within 0.1 foot.

Daily gage height, in feet, of Snake River at Burbank, Wash., for 1910.

[Gage above rapids. Burbank Power & Water Co., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	37.3	37.8	40.1	42.8	46.6	43.2	37.7	35.4	34.8	35.2	36.2	37.8
2	37.5	37.8	43.2	42.4	46.0	43.6	37.6	35.3	34.8	35.1	36.1	38.0
3	37.7	37.4	46.9	42.9	45.4	43.7	37.5	35.3	34.8	35.4	36.0	38.0
4	37.2	37.2	48.2	43.0	44.8	43.5	37.3	35.2	34.9	35.7	36.2	38.0
5	37.3	37.0	48.4	42.9	44.7	43.0	37.2	35.1	34.9	35.9	36.2	38.1
6	37.3	36.9	46.7	42.8	45.0	42.5	37.1	35.0	34.9	37.2	36.3	39.0
7	37.4	36.7	45.2	43.1	45.0	42.2	37.1	35.0	34.8	36.7	36.4	38.9
8	37.2	36.7	.....	43.0	44.9	42.0	37.0	35.0	34.7	36.3	36.4	38.5
9	37.1	36.7	43.4	43.0	45.1	42.0	36.9	35.0	34.6	36.3	36.3	38.2
10	37.0	36.7	42.9	43.6	45.6	41.8	36.7	35.0	34.7	36.3	37.6	38.0
11	38.0	36.8	42.7	44.3	46.3	41.3	36.6	35.0	34.7	36.2	37.8	37.9
12	38.4	36.9	42.6	45.3	47.2	41.1	36.5	34.9	34.7	36.2	38.2	37.7
13	38.0	.....	42.7	46.4	46.9	41.0	36.4	34.85	34.7	36.3	38.8	37.8
14	38.0	37.8	42.9	46.4	46.4	40.8	36.3	34.8	34.6	36.0	38.7	37.8
15	37.1	37.7	43.2	46.0	46.1	40.6	36.2	34.7	34.6	36.0	38.3	37.6
16	36.9	37.6	43.7	45.3	45.7	40.4	36.5	34.7	34.6	36.1	38.0	37.6
17	36.9	37.4	44.1	44.6	45.1	40.0	36.4	34.6	34.7	36.2	37.8	37.4
18	37.6	37.2	44.4	44.5	44.6	40.0	.....	34.7	35.0	36.1	37.5	37.2
19	38.0	37.2	44.5	44.4	44.4	39.8	.....	34.7	35.2	36.1	37.4	37.1
20	37.8	37.2	45.5	45.0	44.4	39.5	36.1	34.7	35.6	36.5	37.2	37.1
21	37.8	37.2	47.8	45.9	44.1	39.2	36.0	34.6	35.7	36.65	37.1	37.0
22	37.8	37.1	48.2	46.5	43.6	39.1	36.0	34.5	35.7	36.5	37.9	36.9
23	37.6	37.2	48.8	46.1	43.4	38.9	36.0	34.4	35.6	36.3	39.2	36.9
24	38.4	37.4	48.8	46.0	43.4	38.7	36.0	34.4	35.5	36.1	38.7	36.7
25	38.6	37.2	.....	46.2	43.6	38.5	35.9	34.4	35.7	36.0	38.5	36.7
26	38.5	37.6	46.5	46.8	43.9	38.3	35.8	34.3	35.5	36.0	38.3	36.8
27	38.3	38.6	45.5	47.8	44.1	38.1	35.7	34.3	35.3	56.2	38.1	36.9
28	38.3	40.6	.....	48.0	43.7	38.0	35.6	34.4	35.3	36.6	38.0	36.8
29	38.3	.....	.....	47.9	44.2	38.0	35.5	34.4	35.3	36.5	37.8	36.8
30	38.0	.....	.....	47.4	43.5	37.9	35.4	34.5	35.2	36.4	37.8	36.7
31	37.8	.....	.....	.....	43.2	.....	35.4	34.7	.....	36.3	.....	36.6

NOTE.—Add 300 feet to reduce to sea level datum.

Daily gage height, in feet, of Snake River at Burbank, Wash., for 1909–10.

[Gage below rapids. Wm. Case, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.								1909.							
1	.....	34.7	28.0	.....	26.5	26.0	28.7	16	.....	30.6	26.6	26.4	26.3	26.2	27.0
2	.....	34.6	27.7	.....	26.4	26.0	28.7	17	.....	30.2	26.5	26.4	26.2	26.0	27.0
3	.....	34.3	27.6	26.4	26.4	26.4	28.3	18	.....	29.8	26.5	26.4	26.1	26.0	26.8
4	.....	34.0	27.4	26.4	26.4	27.2	28.0	19	.....	29.5	26.4	26.3	26.2	26.1	26.6
5	.....	33.8	27.3	26.4	26.4	27.2	27.6	20	.....	29.2	26.4	26.4	26.2	26.3	26.5
6	.....	33.6	27.3	26.4	26.4	27.2	27.1	21	.....	28.9	26.4	26.3	26.2	28.9	26.5
7	.....	33.5	27.2	26.5	26.4	27.2	26.8	22	.....	28.7	26.4	26.4	26.4	27.5	26.2
8	.....	33.1	27.0	26.4	26.4	26.7	27.0	23	.....	28.5	.....	.....	26.4	27.5	26.0
9	.....	32.8	26.9	26.4	26.5	26.5	27.1	24	36.2	28.3	26.4	26.5	26.3	29.1	26.0
10	.....	32.4	26.8	26.4	26.4	26.5	27.2	25	35.9	28.2	26.3	26.3	26.3	31.7	26.1
11	.....	32.4	26.7	26.4	26.4	26.5	27.2	26	35.7	28.0	.....	26.4	26.2	31.7	26.2
12	.....	32.1	26.8	26.4	26.5	26.6	27.2	27	35.4	27.9	.....	26.4	26.2	31.0	26.3
13	.....	32.2	26.8	26.4	26.4	26.5	27.2	28	35.0	27.8	.....	.....	26.2	29.8	26.2
14	.....	31.8	26.7	26.5	26.4	26.5	27.1	29	35.0	28.3	.....	26.3	26.2	29.0	26.0
15	.....	31.2	26.7	26.4	26.4	26.5	27.1	30	34.8	28.7	.....	26.3	26.2	28.8	26.1
								31	.....	28.2	.....	.....	26.6	.....	26.2

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1910.									
1	26.5	29.3	.....	36.4	33.4	.....	25.3	.....	.....
2	26.4	33.8	.....	35.6	33.8	.....	25.2	.....	.....
3	26.3	36.3	.....	35.1	33.9	.....	25.2	.....	.....
4	26.1	37.2	.....	34.6	33.7	.....	.....	.....	24.6
5	26.0	37.1	.....	34.5	33.2	.....	.....	.....	.....
6	26.0	36.6	.....	34.8	32.7	.....	.....	.....	.....
7	26.0	34.7	.....	34.7	32.3	.....	.....	24.4	25.7
8	26.0	33.6	.....	34.7	32.2	.....	.....	.....	25.4
9	26.0	32.5	32.3	35.0	32.2	.....	.....	.....	25.4
10	26.1	32.0	32.9	35.5	31.9	.....	.....	.....	25.3
11	26.1	31.8	33.4	36.2	31.5	.....	.....	.....	25.2
12	26.1	31.7	34.6	37.2	31.3	.....	24.6	.....	25.3
13	26.1	31.7	35.6	36.9	31.2	.....	.....	24.3	25.3
14	26.4	31.8	35.4	36.4	31.0	.....	.....	.....	25.0
15	26.5	32.0	35.1	36.1	30.7	.....	.....	.....	24.9
16	26.5	32.5	34.5	35.9	30.5	.....	.....	.....	.....
17	26.4	32.9	33.9	35.2	30.2	.....	.....	.....	.....
18	26.2	33.1	33.6	34.8	30.2	.....	.....	.....	.....
19	26.3	33.4	33.7	34.6	30.1	.....	.....	25.3	24.7
20	26.1	33.8	34.3	34.3	29.6	26.1	24.4	.....	24.9
21	26.1	37.5	35.2	33.8	29.3	25.8	.....	.....	25.2
22	26.1	37.1	35.8	33.8	29.1	25.8	.....	.....	25.4
23	26.3	37.6	35.5	33.5	28.9	25.8	.....	.....	25.2
24	26.2	38.1	35.3	33.5	28.7	25.8	.....	.....	24.7
25	26.2	36.9	35.4	33.7	28.5	25.8	.....	.....	24.7
26	26.8	35.8	36.3	34.1	28.3	25.7	.....	25.2	24.6
27	27.2	34.5	37.2	34.3	28.0	25.6	24.0	.....	24.9
28	27.4	33.8	37.5	34.0	.....	25.5	.....	.....	24.7
29	.....	33.1	37.4	34.4	.....	25.4	.....	.....	24.4
30	.....	32.6	37.0	33.7	.....	25.4	.....	.....	24.3
31	.....	32.1	.....	33.4	.....	.....	.....	.....	24.1

NOTE.—Add 300 feet to reduce to sea level datum.

NORTH FORK OF SNAKE RIVER AT WARM RIVER, IDAHO.

This station, which is located in sec. 12, T. 9 N., R. 43 E., Boise meridian, about 300 yards above the mouth of Warm River, and about one-fourth mile from the Warm River station on the Yellowstone branch of the Oregon Short Line Railroad, was established September 3, 1910.

Fall River is tributary to North Fork of Snake River about 15 miles below the station, Teton (or Pierre River) about 30 miles below, and South Fork of Snake River about 42 miles below. No very large tributaries flow into North Fork of Snake River above this station.

Records at this point will indicate the amount of water available for the proposed Island Park and Flat Rock storage reservoirs. The stored water is to be used to develop power in this vicinity and for irrigation farther downstream.

The vertical staff gage is located on the left bank. Its datum has remained constant since the station was established.

Discharge measurements are made from a cable and car.

The relation of gage height to discharge is affected by the growth of moss in the river channel during the summer and early fall, but is little affected by the ice during the winter months.

Discharge measurements of North Fork of Snake River at Warm River, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 27	H. L. Stoner	190	471	4.55	1,020
27	do	190	471	4.55	1,020
1911.					
Apr. 2	O. W. Hartwell	194	447	4.49	892
May 13	do	202	846	6.30	2,260
June 4	A. B. Purton	202	812	6.21	2,160
14	H. L. Stoner	198	760	5.92	1,980
July 19[a]	do	192	524	4.82	1,160
Aug. 12[a]	do	187	472	4.70	993
Sept. 14[a]	do	195	454	4.63	960

[a] Moss in channel.

Daily gage height, in feet, and discharge, in second-feet, of North Fork of Snake River at Warm River, Idaho, for 1910.

[Mrs. Josephine Stone, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	4.6	1,050	4.5	990	4.5	990
2	.....	.....	4.6	1,050	4.5	990	4.5	990
3	4.5	990	4.6	1,050	4.5	990	4.5	990
4	4.5	990	4.6	1,050	4.5	990	4.5	990
5	4.5	990	4.6	1,050	4.5	990	4.5	990
6	4.5	990	4.6	1,050	4.5	990	4.5	990
7	4.5	990	4.6	1,050	4.6	1,050	4.5	990
8	4.5	990	4.5	990	4.6	1,050	4.5	990
9	4.5	990	4.6	1,050	4.6	1,000	4.5	999
10	4.5	990	4.6	1,050	4.6	1,050	4.5	990
11	4.5	990	4.6	1,050	4.6	1,050	4.5	990
12	4.5	990	4.6	1,050	4.7	1,110	4.5	990
13	4.6	1,050	4.6	1,050	4.65	1,080	4.4	930
14	4.5	990	4.6	1,050	4.6	1,050	4.4	930
15	4.6	1,050	4.6	1,050	4.6	1,050	4.4	930
16	4.5	990	4.65	1,080	4.6	1,050	4.4	930
17	4.55	1,020	4.65	1,080	4.6	1,050	4.4	930
18	4.55	1,020	4.65	1,080	4.6	1,050	4.5	990
19	4.55	1,020	4.65	1,080	4.6	1,050	4.5	990
20	4.55	1,020	4.65	1,080	4.6	1,050	4.5	990
21	4.55	1,020	4.65	1,080	4.6	1,050	4.5	990
22	4.55	1,020	4.65	1,080	4.6	1,050	4.5	990
23	4.55	1,020	4.55	1,020	4.6	1,050	4.5	990
24	4.55	1,020	4.55	1,020	4.6	1,050	4.5	990
25	4.55	1,020	4.55	1,020	4.6	1,050	4.5	990
26	4.55	1,020	4.55	1,020	4.65	1,080	4.5	990
27	4.55	1,020	4.55	1,020	4.6	1,050	4.5	990
28	4.5	990	4.55	1,020	4.6	1,050	4.4	930
29	4.5	990	4.55	1,020	4.5	990	4.4	930
30	4.5	990	4.55	1,020	4.5	990	4.3	875
31	.....	.....	4.55	1,020	.....	.....	4.3	875

NOTE.—Some ice present during the last few days of December.

Daily discharge determined from a rating curve derived from discharge measurements in 1910 and 1911; curve well defined for the range of stage during 1910.

Monthly discharge of North Fork of Snake River at Warm River, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Sept. 3-30	1,050	990	1,010	56,100	A.
October	1,080	990	1,050	64,600	A.
November	1,110	990	1,040	61,900	A.
December	990	875	969	59,600	A.

NORTH FORK OF SNAKE RIVER NEAR REXBURG, IDAHO.

This station, which is located in sec. 30, T. 6 N., R. 39 E., Boise meridian, and just below the highway bridge 7 miles due west of Rexburg, Idaho, was established April 13, 1909.

It is below all tributaries and diversions. The principal tributaries above Warm, Fall, and Teton rivers, the South channel of the Teton entering about 1 mile above the station.

The vertical staff gage is on the right bank about 150 feet downstream from the highway bridge. Discharge measurements are made by means of a car and cable about a quarter of a mile downstream from the gage.

The gage heights are affected by ice during the winter months. The gage datum has remained unchanged since the station was established.

The bed of the stream at the gaging section is somewhat shifting, but fairly good records may be obtained by making frequent discharge measurements.

Discharge measurements of North Fork of Snake River near Rexburg, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 6	O. W. Hartwell	253	1,250	4.60	2,730
June 4	.....do	266	1,530	5.78	3,570
July 7	.....do	210	524	2.10	774
Aug. 1	Lynn Crandall	200	328	1.25	498
31	Hartwell and Shields	218	655	2.70	1,290
Sept. 27	O. W. Hartwell	224	790	3.11	1,570
Dec. 9	Lynn Crandall	233	966	3.61	1,880

Daily gage height, in feet, of North Fork of Snake River near Rexburg, Idaho, for 1910.

[T. H. Montgomery, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.3	5.0	5.85	4.6	7.5	5.9	.....	1.25	2.75	3.0	3.6	3.7
2	5.3	4.9	5.8	4.4	7.1	6.0	.....	1.3	2.75	3.0	3.65	3.7
3	5.3	4.8	5.85	4.5	6.4	6.4	2.3	1.35	2.7	3.0	3.7	3.7
4	5.3	4.8	5.95	4.7	6.25	6.0	2.2	1.4	2.7	3.1	3.7	3.8
5	5.3	4.7	6.0	4.5	6.2	5.1	2.1	1.5	2.8	3.1	3.65	3.7
6	5.3	4.7	5.7	4.7	6.0	4.9	2.1	1.6	2.8	3.1	3.65	3.65
7	5.3	4.7	5.5	4.5	6.2	4.7	2.0	1.75	2.85	3.0	3.65	3.6
8	5.4	4.7	5.3	4.55	6.3	4.5	1.95	1.8	2.9	3.2	3.7	3.5
9	5.5	4.7	5.1	4.6	6.5	4.35	1.9	1.9	2.95	3.25	3.7	3.5
10	5.6	4.8	4.9	4.85	7.0	4.0	1.9	2.0	2.95	3.25	3.8	3.7
11	5.6	4.8	4.7	5.5	7.2	3.9	1.8	2.2	2.9	3.25	3.8	3.7
12	5.6	4.9	4.5	5.6	7.0	3.8	1.85	2.25	2.9	3.25	3.8	3.6
13	5.6	5.0	4.8	6.4	7.0	4.0	1.85	2.3	2.8	3.3	3.7	3.5
14	5.6	5.0	4.9	6.7	7.4	4.0	1.8	2.4	2.8	3.3	3.7	3.5
15	5.6	5.0	4.6	6.5	7.6	3.8	1.75	2.4	2.7	3.35	3.8	3.5
16	5.6	5.0	4.5	6.0	6.0	3.7	1.7	2.5	2.7	3.4	3.75	3.5
17	5.6	5.0	4.45	5.7	5.3	3.4	1.7	2.55	2.75	3.5	3.75	3.5
18	5.6	5.0	4.5	5.8	5.0	3.2	1.7	2.6	2.75	3.55	3.75	3.5
19	5.4	.....	4.5	6.3	5.2	3.25	1.65	2.7	2.8	3.6	3.8	3.6
20	5.4	.....	4.7	6.6	5.4	3.3	1.6	2.7	2.8	3.5	3.85	3.6
21	5.4	.....	4.9	7.2	4.65	3.2	1.6	2.8	2.8	3.5	3.85	4.0
22	5.4	.....	5.1	7.8	4.7	3.1	1.5	2.9	2.85	3.45	3.8	4.2
23	5.4	.....	5.4	8.0	4.9	3.15	1.5	2.9	2.95	3.45	3.9	6.3
24	5.4	.....	5.5	7.5	5.0	3.0	1.55	2.85	2.95	3.45	4.0	6.4
25	5.4	.....	5.35	7.7	5.5	3.0	1.4	2.7	3.0	3.45	4.0	6.0
26	5.4	.....	5.15	7.8	5.7	.....	1.4	2.7	3.0	3.4	4.0	5.7
27	5.4	.....	5.1	7.9	5.3	.....	1.4	2.7	2.95	3.4	3.9	5.6
28	5.3	.....	5.0	7.9	5.0	.....	1.35	2.6	2.95	3.4	3.95	5.2
29	5.3	.....	4.9	8.0	5.6	.....	1.3	2.7	2.95	3.4	3.9	5.1
30	5.3	.....	4.7	8.4	.....	.....	1.3	2.7	3.0	3.5	3.8	5.05
31	5.0	.....	4.6	.....	.....	.....	1.25	2.7	.....	3.5	.....	5.0

NOTE.—Relation of age height to discharge affected by presence of ice Jan. 1 to about the middle of March and after the middle of December.

Daily discharge, in second-feet, of North Fork of Snake River near Rexburg, Idaho, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2,740	5,700	3,700	980	502	1,300	1,470	1,910	1,990
2	.....	2,560	5,250	3,800	930	525	1,300	1,470	1,950	1,990
3	.....	2,650	4,460	4,200	875	548	1,260	1,470	1,990	1,990
4	.....	2,830	4,300	3,800	825	570	1,260	1,540	1,990	2,070
5	.....	2,650	4,230	2,940	775	615	1,330	1,540	1,950	1,990
6	.....	2,830	4,000	2,760	775	660	1,330	1,540	1,950	1,950
7	.....	2,650	4,200	2,580	725	735	1,360	1,470	1,950	1,910
8	.....	2,700	4,280	2,420	710	760	1,400	1,610	1,990	1,830
9	.....	2,740	4,470	2,290	690	810	1,440	1,640	1,990	1,830
10	.....	2,960	4,980	2,000	690	860	1,440	1,640	2,070	1,990
11	.....	3,600	5,190	1,920	665	960	1,400	1,640	2,070	1,990
12	.....	3,700	4,950	1,850	680	990	1,400	1,640	2,070	1,910
13	.....	4,500	4,930	2,000	675	1,020	1,330	1,680	1,990	1,830
14	.....	4,830	5,320	2,000	665	1,080	1,330	1,680	1,990	1,830
15	.....	4,610	5,500	1,850	650	1,080	1,260	1,720	2,070	1,830
16	2,650	4,100	3,800	1,780	635	1,140	1,260	1,750	2,030	1,830
17	2,600	3,800	3,120	1,560	635	1,170	1,300	1,830	2,030	1,830
18	2,650	3,900	2,850	1,420	640	1,200	1,300	1,870	2,030	1,830
19	2,650	4,400	3,030	1,450	620	1,260	1,330	1,910	2,070	.....
20	2,830	4,720	3,220	1,480	610	1,260	1,330	1,830	2,110	.....
21	3,010	5,380	2,540	1,420	610	1,330	1,330	1,830	2,110	.....
22	3,200	6,090	2,580	1,340	580	1,400	1,360	1,790	2,070	.....
23	3,500	6,330	2,760	1,380	585	1,400	1,440	1,790	2,150	.....
24	3,600	5,730	2,850	1,280	600	1,360	1,440	1,790	2,230	.....
25	3,450	5,970	3,320	1,280	535	1,260	1,470	1,790	2,230	.....
26	3,250	6,090	3,500	1,230	540	1,260	1,470	1,750	2,230	.....
27	3,200	6,210	3,120	1,180	540	1,260	1,440	1,750	2,150	.....
28	3,100	6,210	2,850	1,130	520	1,200	1,440	1,750	2,190	.....
29	3,010	6,330	3,410	1,080	500	1,260	1,440	1,750	2,150	.....
30	2,830	6,810	3,500	1,030	505	1,260	1,470	1,830	2,070	.....
31	2,740	.....	3,600	.....	500	1,260	.....	1,830	.....	.....

NOTE.—Daily discharge Mar. 16 to Apr. 30 and Aug. 1 to Dec. 18 determined from a rating curve fairly well defined below 4,600 second-feet; May 16 to July 7 from a curve fairly well defined; discharge May 1 to 15 and July 8 to 31 computed by indirect method for shifting channel; discharge May 30 and 31 and June 26 to July 2, interpolated.

Monthly discharge of North Fork of Snake River near Rexburg, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 2,300	141,000	D.
February	.....	.....	[a] 2,200	122,000	D.
March	3,600	.....	2,770	170,000	C.
April	6,810	2,560	4,350	259,000	B.
May	5,700	2,540	3,930	242,000	B.
June	4,200	.....	2,000	119,000	B.
July	.....	500	660	40,600	B.
August	1,400	502	1,030	63,300	A.
September	1,470	1,260	1,370	81,500	A.
October	1,910	1,470	1,700	105,000	B.
November	2,230	1,910	2,060	123,000	B.
December	2,070	.....	1,820	112,000	C.
The year	6,810	500	2,180	1,580,000	

[a] Estimated.

NOTE.—Mean discharge Mar. 1–15 estimated at 2,500 second-feet; mean discharge Dec. 19–31 estimated at 1,700 second-feet.

BLACKFOOT RIVER BASIN.

BLACKFOOT RIVER NEAR HENRY, IDAHO.[1]

This station, which is located 200 feet below the wagon bridge at Rockyford, in sec. 11, T. 5 S., R. 40 E., Boise meridian, and 1 mile below the Blackfoot Marsh reservoir, about 12 miles northwest of Henry, the nearest post office, was established July 15, 1908. The railway points from which the station may be most conveniently reached are Fort Hall, about 45 miles west, and Soda Springs, about 30 miles south.

The records show the amount of water available for storage at the reservoir constructed by the Office of Indian Affairs at Blackfoot Marsh. The stored water will be turned into Blackfoot River, then diverted and used for irrigation on the Fort Hall Indian Reservation about 50 miles downstream. The storage of water was begun in the spring of 1910, and gage heights since that time do not indicate the normal daily flow.

No tributaries enter the river between this station and the dam above, and no water is diverted. The principal tributaries between this and the Shelley station at the mouth of the canyon are Corral, Brush, and Wolverine creeks.

The relation between gage height and discharge is seriously affected by the growth of moss in the channel during certain seasons of the year and is somewhat affected by ice during the winter, but a fairly good estimate of winter flow can be made. Gage heights show no effect of artificial control below, but some irregularity is caused by operations at the dam above.

Discharge measurements are made by wading or from the cable located near the vertical staff gage. The gage datum has remained unchanged since the station was established.

No discharge measurements were made during 1910.

The station has been maintained in cooperation with the Office of Indian Affairs.

Daily gage height, in feet, of Blackfoot River near Henry, Idaho, for 1910.

[J. M. Douglass, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.65	.....	2.15	2.85	3.2	1.4	1.65	1.85	2.6	.....	1.15	1.1
2	2.6	2.3	2.1	2.9	3.2	1.45	1.65	1.85	2.6	.....	1.15	1.1
3	2.6	2.3	2.05	2.95	3.2	1.4	1.7	1.9	2.6	.....	1.15	1.1
4	2.6	2.35	2.05	2.95	3.2	1.4	1.65	1.9	2.6	.....	1.15	1.1
5	2.6	2.4	2.0	3.0	3.15	1.5	1.65	2.05	2.6	1.2	1.15	1.1
6	2.6	2.35	2.0	3.0	3.15	1.6	1.6	2.1	2.6	1.2	1.05	1.1
7	2.6	2.35	2.0	3.0	3.15	1.7	1.5	2.2	2.6	1.2	1.05	.....
8	2.6	2.3	2.0	3.0	3.15	1.7	.....	2.2	2.6	1.2	1.05	.....
9	2.55	.....	2.0	3.05	3.15	1.7	.....	2.2	2.7	1.2	1.05	.....
10	2.5	2.25	2.0	3.05	3.15	1.7	1.5	2.2	2.7	1.2	1.05	1.1

[1] This station was described as "near Rossfork" in Water-Supply Paper 252, p. 231.

Daily gage height, in feet, of Blackfoot River near Henry, Idaho, for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	2.4	2.3	2.0	3.1	3.1	1.7	1.55	2.25	2.7	1.15	1.05	.....
12	2.4	2.25	2.0	3.1	3.1	1.7	1.55	2.25	2.75	1.15	1.05	.....
13	2.4	2.3	1.95	3.1	2.5	1.7	1.5	2.25	2.7	1.15	1.05	.....
14	2.3	2.3	2.0	3.1	2.2	1.7	1.45	2.25	2.7	1.15	1.05	.....
15	2.3	2.3	2.0	3.1	2.1	1.7	1.45	2.25	2.7	1.15	1.05	.....
16	2.3	2.3	2.0	3.15	1.9	1.7	1.45	2.25	2.75	1.15	1.05	.....
17	2.3	2.3	2.0	3.1	1.7	1.7	1.45	2.25	2.75	1.15	1.05	.....
18	2.3	2.3	2.0	3.1	1.4	1.7	1.45	2.4	2.8	1.15	1.05	.....
19	2.3	2.3	2.0	3.15	1.4	1.7	1.5	2.5	2.75	1.15	1.05	.....
20	.....	2.35	2.0	3.15	1.4	1.75	1.5	2.5	2.7	1.15	1.05	.....
21	2.3	.....	2.1	3.1	1.4	1.75	1.55	2.5	2.6	1.15	1.05	.....
22	2.25	2.45	2.2	3.15	.....	1.75	1.55	.....	2.55	1.15	1.05	.....
23	2.25	2.35	2.3	3.2	1.4	1.75	1.55	2.5	2.5	1.15	1.1	.....
24	2.25	2.35	2.4	3.2	1.45	1.8	1.55	2.5	2.45	1.15	1.1	.....
25	2.3	2.3	2.5	3.2	1.45	1.8	1.75	2.5	2.35	1.15	1.1	.....
26	2.35	2.3	2.5	3.2	1.45	1.8	1.7	2.5	2.3	1.15	1.1	.....
27	2.5	2.25	2.6	3.15	1.45	1.8	1.7	2.5	2.25	1.15	1.1	.....
28	2.4	.....	2.7	3.2	1.45	1.8	1.7	2.55	2.2	1.15	1.1	.....
29	2.35	.....	2.8	3.2	1.45	1.7	1.7	2.6	.....	1.15	1.1	.....
30	2.35	.....	2.8	3.15	1.5	1.7	1.7	2.6	.....	1.15	1.1	.....
31	2.35	.....	2.85	.....	1.5	.....	1.7	2.6	.....	1.15	.....	.....

NOTE.—Relation of gage height to discharge considerably affected by presence of ice from Jan. 1 to Mar. 20, and slightly affected during latter part of November and December. Gage heights were affected by backwater from growth of moss in channel from about June 20 to some time in October.

Daily discharge, in second-feet, of Blackfoot River near Henry, Idaho, for 1910.

Day.	Mar.	Apr.	May.	June.	Nov.	Dec.
1	.....	735	980	81	.....	28
2	.....	770	980	92	.....	28
3	.....	805	980	81	.....	28
4	.....	805	980	81	.....	28
5	.....	840	945	103	.....	28
6	.....	840	945	127	21	28
7	.....	840	945	153	21	.....
8	.....	840	945	153	21	.....
9	.....	875	945	153	21	.....
10	.....	875	945	153	21	28
11	.....	910	910	153	21	.....
12	.....	910	910	153	21	.....
13	.....	910	500	153	21	.....
14	.....	910	335	153	21	.....
15	.....	910	290	153	21	.....
16	.....	945	214	153	21	.....
17	.....	910	153	153	21	.....
18	.....	910	81	153	21	.....
19	.....	945	81	.....	21	.....
20	.....	945	81	.....	21	.....
21	290	910	81	.....	21	.....
22	335	945	81	.....	21	.....
23	385	980	81	.....	28	.....
24	440	980	92	.....	28	.....
25	500	980	92	.....	28	.....
26	500	980	92	.....	28	.....
27	564	945	92	.....	28	.....
28	631	980	92	.....	28	.....
29	700	980	92	.....	28	.....
30	700	945	103	.....	28	.....
31	735	.....	103	.....	.....	.....

NOTE.—Daily discharge Mar. 21 to June 19 and Nov. 6 to Dec. 10 determined from a well-defined rating curve based on measurements made during normal condition of channel, 1908 to 1911. Estimates of daily discharge June 20 to Nov. 5 are roughly approximate and not considered of sufficient accuracy for publication.

Monthly discharge of Blackfoot River near Henry, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	240	14,800	D.
February	.....	.....	225	12,500	D.
March	735	.....	315	19,400	D.
April	980	735	902	53,700	B.
May	980	81	456	28,000	B.
June	153	81	140	8,330	B.
July	.....	.....	42.2	2,590	C.
August	.....	.....	312	19,200	C.
September	.....	.....	448	26,700	C.
October	.....	.....	24.9	1,530	C.
November	28	21	24.0	1,430	C.
December	.....	.....	28.0	1,720	D.
The year	980	.....	263	190,000	

NOTE.—Mean discharge January, February, and July to October estimated from climatological records observers' notes, and hydrograph comparisons with records of station at the mouth of the canyon. Mean discharge Mar. 1 to 20 estimated 200 second-feet; mean discharge June 20 to 30 estimated 150 second-feet; mean discharge Nov. 1 to 5 estimated 28 second-feet; mean discharge Dec. 6 to 9, and 11 to 31 estimated 28 second-feet.

BLACKFOOT RIVER NEAR SHELLEY, IDAHO.

This station, which is located in sec. 7, T. 2 S., R. 38 E., Boise meridian, about 1½ miles above the mouth of the canyon, 18 miles northeast from Blackfoot, and about 10 miles southeast from Shelley, the nearest post office and railway station, was established June 26, 1909.

The principal tributaries that enter the Blackfoot between this station and the Blackfoot Marsh reservoir, 37 miles above, are Corral Creek, 30 miles above; Brush Creek, 15 miles above, and Wolverine Creek, 1¼ miles above. The river receives no important tributaries below the station and there are no important diversions above. The water stored in the reservoir above will be diverted from the Blackfoot River, a short distance below this station. The records are therefore of value in regulating this stored water and determining the amount available for diversion.

A vertical staff gage in a stilling box is located on the right bank 20 feet above the cable from which discharge measurements are made. A Friez improved automatic gage, inclosed in a small gage house, is located on the right bank 10 feet above the cable. The automatic gage is set weekly to correspond with the staff gage. The gage datum has remained unchanged since the station was established.

Because of ice and damage to gage by floods no observations were made from January to March, 1910. The gage heights are unaffected by control below, but some irregularity of flow is caused by the operation of the gates in the Indian Office dam above.

The station has been maintained in cooperation with the Office of Indian Affairs.

Discharge measurements of Blackfoot River near Shelley, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 2	O. W. Hartwell	92	263	5.46	1,040
7	do	92	262	5.45	1,030
June 1[a]	do	88	112	3.80	178
Aug. 25	Lynn Crandall	87	171	4.35	421
31	do	88	185	4.50	479
Sept. 27[a]	do	88	170	4.35	411
29	Bolster and Crandall	88	159	4.26	361
Dec. 6[a]	Lynn Crandall	88	76	3.36	71

[a] By wading at cable section.

Daily gage height, in feet, of Blackfoot River near Shelley, Idaho, for 1910.

[R. E. Reid, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.48	3.78	3.71	3.48	4.49	3.36	3.28	.....
2	5.43	5.48	3.74	3.67	3.54	4.49	3.38	3.28	.....
3	5.42	5.45	3.72	3.62	3.69	4.49	3.48	3.29	.....
4	5.38	5.44	3.72	3.61	3.66	4.48	3.49	3.29	.....
5	5.38	5.47	3.91	3.61	3.88	4.47	3.47	3.29	.....
6	5.41	5.50	3.93	3.61	4.03	4.47	3.45	3.31	3.41
7	5.42	5.46	3.93	3.55	4.18	4.46	3.43	3.32	3.48
8	5.44	5.42	3.93	3.38	4.22	4.46	3.42	3.31	3.38
9	5.50	5.40	3.93	3.33	4.22	4.47	3.42	3.31	3.50
10	5.55	5.38	3.92	3.29	4.22	4.60	3.41	3.30	3.40
11	5.57	5.36	3.91	3.26	4.22	4.60	3.39	3.30	3.48
12	5.56	5.34	3.90	3.24	4.24	4.61	3.39	3.30	3.45
13	5.55	5.06	3.89	3.19	4.23	4.67	3.40	3.30	3.41
14	5.49	4.73	3.89	3.15	4.22	4.67	3.40	3.29	3.33
15	5.49	4.57	3.89	3.19	4.21	4.66	3.39	3.28	3.42
16	5.51	4.52	3.89	3.15	4.20	4.68	3.39	3.27	3.39
17	5.50	4.30	3.90	3.13	4.20	4.76	3.41	3.27	3.33
18	5.51	4.12	3.90	3.15	4.20	4.81	3.41	3.28	3.34
19	5.52	3.93	3.90	3.10	4.20	4.79	3.39	3.31	3.38
20	5.52	3.93	3.89	3.08	4.37	4.74	3.36	3.24	3.45
21	5.52	3.94	3.88	3.09	4.37	4.71	3.35	3.32	3.42
22	5.51	3.92	3.88	3.07	4.36	4.64	3.33	3.28	3.43
23	5.50	3.90	3.88	3.07	4.35	4.59	3.32	3.33	3.41
24	5.49	3.89	3.88	3.04	4.35	4.53	3.31	3.37	3.43
25	5.48	3.88	3.86	3.05	4.35	4.47	3.30	3.37	3.36
26	5.48	3.87	3.84	3.56	4.35	4.42	3.29	3.30	3.29
27	5.47	3.86	3.79	3.66	4.35	4.36	3.28	.....	3.31
28	5.46	3.87	3.84	3.65	4.48	4.30	3.28	.....	3.33
29	5.48	3.86	3.87	3.63	4.52	4.24	3.28	.....	.....
30	5.47	3.83	3.78	3.55	4.51	3.65	3.28	.....	.....
31	.....	3.81	.....	3.47	4.50	.....	3.28	.....	3.22

NOTE.—Daily gage heights obtained from an automatic gage. Some ice present about Dec. 14 to 31.

Daily discharge, in second-feet, of Blackfoot River near Shelley, Idaho, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,050	186	165	107	484	83	69	82
2	1,020	1,050	174	154	121	484	86	69	84
3	1,010	1,030	168	140	159	484	107	70	86
4	988	1,020	168	138	151	479	109	70	88
5	988	1,040	229	138	218	473	105	70	90
6	1,010	1,060	236	138	273	473	100	74	92
7	1,010	1,040	236	123	334	468	96	76	107
8	1,020	1,010	236	86	351	468	94	74	86
9	1,060	1,000	236	77	351	473	94	74	111
10	1,090	988	232	70	351	542	92	72	90
11	1,100	976	229	66	351	542	88	72	107
12	1,100	964	225	63	360	548	88	72	100
13	1,090	801	222	56	356	580	90	72	92
14	1,050	614	222	51	351	580	90	70	70
15	1,050	526	222	56	347	575	88	69	70
16	1,070	500	222	51	342	586	88	68	70
17	1,060	388	225	49	342	631	92	68	60
18	1,070	308	225	51	342	659	92	69	60
19	1,070	236	225	45	342	647	88	74	60
20	1,070	236	222	43	422	619	83	63	60
21	1,070	239	218	44	422	603	81	76	60
22	1,070	232	218	42	417	564	77	69	60
23	1,060	225	218	42	412	537	76	77	60
24	1,050	222	218	39	412	505	74	85	60
25	1,050	218	212	40	412	473	72	85	60
26	1,050	215	205	125	412	447	70	72	50
27	1,040	212	189	151	412	417	69	74	50
28	1,040	215	205	148	479	388	69	76	50
29	1,050	212	215	143	500	360	69	78	50
30	1,040	202	186	123	494	148	69	80	50
31	.....	195	.....	105	489	.....	69	.....	50

NOTE.—Daily discharge determined from a rating curve well defined above 250 second-feet and fairly well defined below. Discharge interpolated Nov. 27 to Dec. 5 and estimated, because of ice, Dec. 14 to 31.

Monthly discharge of Blackfoot River near Shelley, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 2-30	1,100	988	1,050	60,400	A.
May	1,060	195	588	36,200	A.
June	236	168	214	12,700	B.
July	165	39	89.1	5,480	B.
August	500	107	349	21,500	A.
September	659	148	508	30,200	A.
October	109	69	85.4	5,250	B.
November	85	63	72.9	4,340	B.
December	111	50	73.1	4,490	C.
The period	.....	.....	.....	181,000	

BIG LOST RIVER BASIN.

GENERAL FEATURES.

Big Lost River rises in the southern part of Custer County, Idaho, flows northeastward to a point about 3 miles southeast of Chilly, then turns abruptly and flows southeastward for about 50 miles. About

15 miles below Lost River it makes another turn to the northeast and 25 miles farther on its waters are lost in a sink.

BIG LOST RIVER NEAR CHILLY, IDAHO.

This station, which is located in sec. 30, T. 8 N., R. 21 E., Boise meridian, at Howell's ranch, the last one on the left bank, about 30 miles upstream from Mackay, Idaho, 12 miles from Chilly, and 7 miles above Kinickinick Point, was established April 25, 1904, discontinued August 31, 1906, and reestablished July 1, 1907.

Until April 20, 1906, the gage was located one-fourth mile from the ranch; it was then moved to a point near the ranch buildings in order to place it on the main channel. The cable is about one-half mile below the gage.

The stream receives several small tributaries below the station. One small irrigation ditch diverts above the station.

The gage heights are not affected by artificial control above the station, but ice prevails to such an extent that it is necessary to discontinue readings for about five months in the winter.

Discharge measurements of Big Lost River near Chilly, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 16	O. W. Hartwell	82	170	2.91	401
Aug. 3	L. Crandall	81	143	2.52	209
Oct. 3	H. L. Stoner	80	122	2.36	149
3	do	80	122	2.36	146
Dec. 19	A. B. Purton	71	80	[a] 2.98	68

[a] Gage height read to water surface through hole in ice.

Daily gage height, in feet, of Big Lost River near Chilly, Idaho, for 1910.

[Maud Howell, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	3.2	2.5	2.3	2.35	2.3	16	3.5	2.85	2.4	2.7	2.35	2.25
2	.....	3.15	2.5	2.25	2.35	2.3	17	3.6	2.85	2.4	2.8	2.35	2.25
3	.....	3.15	2.5	2.3	2.35	2.3	18	3.5	2.85	2.4	2.8	2.35	2.25
4	.....	3.10	2.5	2.3	2.35	2.3	19	3.4	2.9	2.4	2.6	2.3	2.25
5	.....	3.05	2.5	2.3	2.5	2.3	20	3.5	2.85	2.35	2.6	2.3	.....
6	.....	3.00	2.5	2.3	2.45	2.25	21	3.4	2.9	2.35	2.5	2.3	.....
7	.....	2.95	2.5	2.25	2.4	2.25	22	3.3	2.8	2.35	2.5	2.3	.....
8	.....	2.95	2.45	2.25	2.35	2.25	23	3.2	2.8	2.35	2.5	2.3	.....
9	.....	3.00	2.45	2.25	2.4	2.3	24	3.2	2.7	2.35	2.45	2.3	.....
10	.....	2.95	2.45	2.25	2.4	2.3	25	3.3	2.7	2.35	2.45	2.3	.....
11	.....	2.90	2.45	.....	2.4	2.3	26	3.3	2.7	2.35	2.45	2.3	.....
12	.....	2.85	2.45	.....	2.4	2.35	27	3.3	2.65	2.3	2.40	2.3	.....
13	.....	2.80	2.45	.....	2.4	2.3	28	3.2	2.6	2.3	2.40	2.3	.....
14	.....	2.80	2.4	.....	2.4	2.25	29	3.2	2.5	2.3	2.35	2.3	.....
15	3.45	2.95	2.4	2.6	2.4	2.25	30	3.2	2.55	2.3	2.35	2.3	.....
							31	.....	2.55	2.3	.....	2.3	.....

Daily discharge, in second-feet, of Big Lost River near Chilly, Idaho, for 1910.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	570	207	130	148	130	16	790	365	166	295	148	114
2	.....	538	207	114	148	130	17	870	365	166	340	148	114
3	.....	538	207	130	148	130	18	790	365	166	340	148	114
4	.....	505	207	130	148	130	19	710	390	166	250	130	114
5	.....	475	207	130	207	130	20	790	365	148	250	130	.....
6	.....	445	207	130	186	114	21	710	390	148	207	130	.....
7	.....	418	207	114	166	114	22	640	340	148	207	130	.....
8	.....	418	186	114	148	114	23	570	340	148	207	130	.....
9	.....	445	186	114	166	130	24	570	295	148	186	130	.....
10	.....	418	186	114	166	130	25	640	295	148	186	130	.....
11	.....	390	186	148	166	130	26	640	295	148	186	130	.....
12	.....	365	186	182	166	148	27	640	272	130	166	130	.....
13	.....	340	186	216	166	130	28	570	250	130	166	130	.....
14	.....	340	166	250	166	114	29	570	207	130	148	130	.....
15	750	418	166	250	166	114	30	570	228	130	148	130	.....
							31	.....	228	130	.....	130	.....

NOTE.—Daily discharge determined from a rating curve, derived from discharge measurements made during 1907 to 1910; well defined between 100 and 3,000 second-feet.

Monthly discharge of Big Lost River near Chilly, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 15–30	870	570	676	21,500	A.
July	570	207	375	23,100	A.
August	207	130	169	10,400	A.
September	340	114	185	11,000	A.
October	207	130	148	9,100	A.
November 1–19	148	114	123	4,630	A.
The period	.....	.....	.....	79,700	

LITTLE LOST RIVER NEAR CLYDE, IDAHO.

This station, which is located at the Mulkey ranch in sec. 18, T. 10 N., R. 27 E., Boise meridian, about 1 mile upstream from Clyde post office, was established August 28, 1910.

The station is above Wet Creek and below Pass Creek and Sawmill ditch.

The vertical staff gage is about 100 yards from the ranch house. Its datum has remained constant.

Discharge measurements are made by wading or from a foot log across the stream.

Discharge measurements of Little Lost River near Clyde, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 28	O. W. Hartwell	20	27	1.88	38
Sept. 29	H. L. Stoner	19	27	1.85	39
30	do	19	27	1.87	39
30	do	19	27	1.87	39

Daily gage height, in feet, of Little Lost River near Clyde, Idaho, for 1910.

[Clarence Mulkey, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.8	1.77	1.95	1.75	16	.....	1.9	1.9	1.57	1.4
2	.....	1.8	1.8	1.95	1.7	17	.....	1.9	1.9	1.6	1.4
3	.....	1.8	1.9	1.9	1.65	18	.....	2.0	1.9	1.75	1.4
4	.....	1.8	1.9	1.9	1.5	19	.....	1.9	1.8	1.7	1.45
5	.....	1.8	1.8	1.7	1.55	20	.....	1.8	1.9	1.65	1.3
6	.....	1.8	1.9	1.7	1.65	21	.....	1.9	1.9	1.7	1.25
7	.....	1.8	1.9	1.8	1.6	22	.....	1.8	1.8	1.65	1.25
8	.....	1.8	1.8	1.8	1.65	23	.....	1.9	1.9	1.7	1.25
9	.....	1.8	1.9	1.8	1.7	24	.....	1.8	1.9	1.8	1.25
10	.....	1.77	1.9	1.8	1.6	25	.....	1.9	1.8	1.7	1.25
11	.....	1.8	1.8	1.8	1.5	26	.....	1.9	1.9	1.6	1.25
12	.....	1.8	1.9	1.8	1.55	27	.....	1.9	1.9	1.65	1.25
13	.....	1.9	1.9	1.75	1.55	28	1.9	1.8	1.8	1.7	1.2
14	.....	1.9	1.9	1.7	1.45	29	1.9	1.9	1.9	1.85	1.2
15	.....	1.9	1.8	1.65	1.4	30	1.9	1.9	1.9	1.8	1.2
						31	1.9	.....	1.8	.....	1.2

Daily discharge, in second-feet, of Little Lost River near Clyde, Idaho, for 1910.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	36	34	44	34	16	.....	41	41	25	18
2	.....	36	36	44	31	17	.....	41	41	26	18
3	.....	36	41	41	28	18	.....	47	41	34	18
4	.....	36	41	41	22	19	.....	41	36	31	20
5	.....	36	36	31	24	20	.....	36	41	28	15
6	.....	36	41	31	28	21	.....	41	41	31	14
7	.....	36	41	36	26	22	.....	36	36	28	14
8	.....	36	36	36	28	23	.....	41	41	31	14
9	.....	36	41	36	31	24	.....	36	41	36	14
10	.....	34	41	36	26	25	.....	41	36	31	14
11	.....	36	36	36	22	26	.....	41	41	26	14
12	.....	36	41	36	24	27	.....	41	41	28	14
13	.....	41	41	34	24	28	41	36	36	31	12
14	.....	41	41	31	20	29	41	41	41	38	12
15	.....	41	36	28	18	30	41	41	41	36	12
						31	41	.....	36	.....	12

NOTE.—Daily discharges determined from a fairly well-defined rating curve based on 1910–11 measurements.

Monthly discharge of Little Lost River near Clyde, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
September	47	34	38.5	2,290	A.
October	41	34	39.2	2,410	A.
November	44	25	33.4	1,990	A.
December	34	12	20.0	1,230	B.

BIRCH CREEK NEAR KAUFMAN, IDAHO.

This station, which is located at the Worthing ranch in sec. 13, T. 10 N., R. 29 E., Boise meridian, about 2½ miles upstream from Kaufman, was established September 5, 1910, to determine the water supply available for a proposed reservoir in the vicinity.

The Reno ditch diverts water about 8 miles below the station.

The vertical staff gage and cable are located about 200 yards below the ranch house. The datum of the gage has remained constant since the station was established.

Discharge measurements are made from the cable or by wading.

The flow at this station during the greater part of the year comes entirely from springs and is very constant. The relation between gage height and discharge is probably affected to some extent by the presence of moss during the summer and fall and by ice during the winter.

Discharge measurements of Birch Creek near Kaufman, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 5[a]	O. W. Hartwell	18	28	1.89	81
21	H. L. Stoner	36	35	1.9	92
21	.....do	36	35	1.9	94
1911.					
May 1	J. C. Dort	35	37	1.94	86.4
June 18	H. L. Stoner	35	33.8	1.90	89.4
Sept. 19	.....do	35	33.9	1.89	87.0

[a] Made from bridge at Worthing's ranch.

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek near Kaufman, Idaho, for 1910.

[Mrs. F. G. Worthing, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	1.89	86	1.9	88	1.9	88
2	.....	.....	1.9	88	1.9	88	1.9	88
3	.....	.....	1.9	88	1.9	88	1.9	88
4	.....	.....	1.9	88	1.9	88	1.9	88
5	1.9	88	1.9	88	1.9	88	1.9	88
6	1.9	88	1.9	88	1.9	88	1.9	88
7	1.9	88	1.9	88	1.9	88	1.9	88
8	1.9	88	1.9	88	1.9	88	1.9	88
9	1.9	88	1.9	88	1.9	88	1.9	88
10	1.9	88	1.9	88	1.9	88	1.9	88
11	1.9	88	1.9	88	1.9	88	1.9	88
12	1.9	88	1.9	88	1.9	88	1.9	88
13	1.9	88	2.0	110	1.9	88	1.9	88
14	1.9	88	1.95	99	1.9	88	1.9	88
15	1.9	88	1.95	99	1.9	88	1.9	88
16	1.9	88	1.95	99	1.9	88	1.9	88
17	1.9	88	1.95	99	1.9	88	1.9	88
18	1.9	88	1.95	99	1.9	88	1.9	88
19	1.9	88	1.95	99	1.9	88	1.9	88
20	1.9	88	1.95	99	1.9	88	1.9	88
21	1.9	88	1.95	99	1.9	88	1.9	88
22	1.9	88	1.95	99	1.9	88	1.9	88
23	1.9	88	1.95	99	1.9	88	1.9	88
24	1.9	88	1.95	99	1.9	88	1.9	88
25	1.9	88	1.95	99	1.9	88	1.9	88
26	1.9	88	1.95	99	1.9	88	1.9	88
27	1.9	88	1.95	99	1.9	88	1.9	88
28	1.9	88	1.95	99	1.9	88	1.9	88
29	1.89	86	1.9	88	1.9	88	1.9	88
30	1.86	80	1.9	88	1.9	88	1.9	88
31	.....	.....	1.9	88	.....	.....	1.9	88

NOTE.—Daily discharges were estimated from the discharge measurements made during 1910 and 1911.

Monthly discharge of Birch Creek near Kaufman, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
September 5-30	88	80	87.6	4,520	B.
October	110	86	94.0	5,780	B.
November	88	88	88.0	5,240	B.
December	88	88	88.0	5,410	B.

PORTNEUF RIVER BASIN.

PORTNEUF RIVER NEAR PEBBLE, IDAHO.

This station, which is located at Gamble's ranch, in sec. 26, T. 7 S., R. 38 E., Boise meridian, 3 miles north of Pebble post office, was established September 8, 1910.

The station is about 8 miles below the site of a proposed reservoir. Topons Creek and a number of springs enter Portneuf River between the reservoir site and the station. It is planned to divert Topons Creek into the reservoir. The records at this station will, therefore, indicate the water supply available for storage after making allowance for the springs.

The equipment consists of a staff gage and a suspension gaging bridge near the ranch buildings. The gage datum has remained constant.

Discharge measurements of Portneuf River near Pebble, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 8	O. W. Hartwell	26	31	2.11	39
16	H. L. Stoner	26	35	2.1	39
16	do	26	35	2.1	38

Daily gage height, in feet, of Portneuf River near Pebble, Idaho, for 1910.

[D. C. Hibbard, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		2.2	2.2	2.3	16	2.1	2.2	2.2	2.2
2		2.2	2.2	2.3	17	2.1	2.2	2.2	2.3
3		2.2	2.2	2.3	18	2.1	2.2	2.2	2.3
4		2.2	2.2	2.3	19	2.1	2.2	2.2	2.3
5		2.2	2.2	2.3	20	2.1	2.2	2.2	2.3
6		2.2	2.2	2.3	21	2.1	2.2	2.3	2.3
7		2.2	2.2	2.3	22	2.1	2.2	2.3	2.3
8	2.1	2.2	2.2	2.2	23	2.1	2.2	2.4	2.3
9		2.2	2.2	2.2	24	2.1	2.2	2.4	2.3
10		2.2	2.2	2.2	25	2.1	2.2	2.4	2.3
11		2.2	2.2	2.2	26	2.1	2.2	2.4	2.2
12		2.2	2.2	2.3	27	2.1	2.2	2.35	2.2
13		2.2	2.2	2.4	28	2.15	2.2	2.3	2.2
14		2.2	2.2	2.3	29	2.15	2.2	2.3	2.2
15		2.2	2.2	2.1	30	2.1	2.2	2.3	2.2
					31		2.2		2.2

Daily discharge, in second-feet, of Portneuf River near Pebble, Idaho, for 1910.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	47	47	56	16	39	47	47	47
2	.....	47	47	56	17	39	47	47	56
3	.....	47	47	56	18	39	47	47	56
4	.....	47	47	56	19	39	47	47	56
5	.....	47	47	56	20	39	47	47	56
6	.....	47	47	56	21	39	47	56	56
7	.....	47	47	56	22	39	47	56	56
8	39	47	47	47	23	39	47	66	56
9	39	47	47	47	24	39	47	66	56
10	39	47	47	47	25	39	47	66	56
11	39	47	47	47	26	39	47	66	47
12	39	47	47	56	27	39	47	61	47
13	39	47	47	66	28	43	47	56	47
14	39	47	47	56	29	43	47	56	47
15	39	47	47	39	30	39	47	56	47
					31	.....	47	.....	47

NOTE.—These daily discharges are based on a rating curve derived from measurements made 1910–12.

Monthly discharge of Portneuf River near Pebble, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
September 8–30	43	39	39.3	1,790	A.
October	47	47	47.0	2,890	A.
November	66	47	51.5	3,060	A.
December	66	39	52.6	3,230	A.

RAFT RIVER BASIN.

GENERAL FEATURES.

Raft River rises on the eastern slope of Goose Creek Mountain in the southwestern part of Cassia County, Idaho, flows southeastward a short distance into Utah, then turns to the east and north, reenters Idaho, and takes a general northerly course to its junction with Snake River, about 12 miles above the Minidoka dam.

RAFT RIVER NEAR BRIDGE, IDAHO.

This station, which is located at a wagon bridge on the Langford ranch, about 4 miles from Bridge, the nearest post office, and about 25 miles southeast of Albion, Idaho, in sec. 27, T. 15 S., R. 26 E., Boise meridian, was established September 18, 1909.

The river receives no important tributaries above the station. The principal tributaries below are Clear Creek, which enters about 8 miles below, and Cassia Creek, entering about 15 miles below. All the normal low-water flow is already appropriated by ranches above the station.

The vertical staff gage is attached to the right abutment on the downstream side of the bridge. The gage was destroyed by a flood

on March 1, 1910. A new gage was established March 15 at the same location, but with a datum 3.42 feet lower than that of the previous gage.

Discharge measurements are made from the bridge or by wading.

The gage heights are affected by ice during the winter months, but are not affected by artificial control above or below.

Discharge measurements of Raft River near Bridge, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 16[a]	G. C. Baldwin	14.5	52.5	5.63	90.1
Apr. 17[b]	do	21	20.8	5.45	79.6
Sept. 14	O. W. Hartwell	13	4.9	4.69	4.9
Oct. 9	Lynn Crandall	14	6.9	4.75	7.8
20	O. W. Hartwell	15	7.5	4.78	10.3
Dec. 2	Lynn Crandall	16	11	4.83	15.8

[a] Measured at a point 1 mile above station. High water channel measured and found to be carrying 55.8 second-feet.
[b] High water channel carrying 30 second-feet.
NOTE.—Gage heights of measurements are referred to datum of gage established Mar. 15, 1910.

Daily gage height, in feet, of Raft River near Bridge, Idaho, for 1910.

[J. T. Hawkins, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.9	4.0	.....	5.5	5.5	4.9	4.8	4.8	4.7	4.9	4.8	4.8
2	1.8	4.05	.....	5.5	5.6	4.9	4.8	4.8	4.7	4.9	4.8	4.8
3	1.7	4.1	.....	5.5	5.7	4.9	4.8	4.8	4.7	4.9	4.8	4.8
4	1.6	4.1	.....	5.5	5.6	4.8	4.8	4.8	4.7	4.9	4.8	4.85
5	1.55	4.2	.....	5.6	5.5	4.8	4.8	4.8	4.75	4.85	4.8	4.85
6	1.55	4.0	.....	5.6	5.4	4.8	4.8	4.8	4.75	4.85	4.8	4.85
7	1.5	4.0	.....	5.6	5.3	4.8	4.8	4.8	4.75	4.8	4.8	4.85
8	1.5	4.0	.....	5.5	5.2	4.8	4.8	4.8	4.75	4.8	4.8	4.9
9	1.55	4.0	.....	5.5	5.2	4.8	4.8	4.8	4.75	4.8	4.8	4.9
10	1.6	4.0	.....	5.6	5.2	4.8	4.8	4.8	4.75	4.8	4.8	4.9
11	1.45	4.0	.....	5.65	5.2	4.8	4.8	4.8	4.75	4.8	4.85	4.9
12	1.65	4.05	.....	5.7	5.2	4.8	4.8	4.8	4.75	4.8	4.85	4.95
13	1.85	4.1	.....	5.7	5.1	4.8	4.8	4.8	4.8	4.75	4.85	5.0
14	1.95	4.2	.....	5.6	5.1	4.8	4.8	4.8	4.9	4.75	4.85	5.05
15	2.0	4.4	5.9	5.5	5.1	4.8	4.8	4.8	4.9	4.75	4.85	5.2
16	2.15	4.6	5.9	5.5	5.1	4.8	4.8	4.8	4.95	4.75	4.85	5.3
17	2.15	4.8	6.0	5.5	5.1	4.8	4.8	4.8	5.15	4.75	4.85	5.5
18	2.25	4.9	6.0	5.5	5.0	4.8	4.8	4.75	5.25	4.75	4.85	5.5
19	2.35	5.0	6.0	5.5	5.0	4.8	4.8	4.75	5.3	4.75	4.85	5.5
20	2.45	5.0	6.0	5.4	5.0	4.8	4.8	4.75	5.3	4.75	4.85	5.5
21	3.0	5.0	6.0	5.4	5.0	4.8	4.8	4.75	5.3	4.75	4.85	5.5
22	3.05	5.0	6.0	5.45	4.9	4.8	4.8	4.75	5.3	4.75	4.85	5.55
23	3.75	5.0	6.0	5.5	4.9	4.8	4.8	4.75	5.3	4.75	4.85	5.55
24	4.0	4.5	5.9	5.5	4.9	4.8	4.8	4.7	5.1	4.75	4.85	5.6
25	4.05	4.0	5.9	5.5	4.9	4.8	4.8	4.7	5.0	4.75	4.85	5.6
26	4.0	3.5	5.8	5.5	4.9	4.8	4.8	4.7	5.0	4.75	4.85	5.7
27	4.0	6.0	5.7	5.5	4.9	4.8	4.8	4.7	5.0	4.75	4.85	5.7
28	4.0	8.0	5.6	5.5	4.9	4.8	4.8	4.7	5.0	4.8	4.8	5.7
29	4.0	.....	5.5	5.5	4.9	4.8	4.8	4.7	4.95	4.8	4.8	5.65
30	4.0	.....	5.5	5.5	4.9	4.8	4.8	4.7	4.9	4.8	4.8	5.65
31	4.0	.....	5.5	.....	4.9	.....	4.8	4.7	.....	4.8	.....	5.6

NOTE.—Gage heights for January and February are referred to datum of original gage. Gage heights after Mar. 15 are referred to datum of gage established that date. No readings for the period Mar. 1 to 14. The relation of gage height to discharge was affected by the presence of ice during January, February, and Dec. 15 to 31.

Daily discharge, in second-feet, of Raft River near Bridge, Idaho, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	119	119	20	12	12	5	20	12	12
2	.....	119	139	20	12	12	5	20	12	12
3	.....	119	159	20	12	12	5	20	12	12
4	.....	119	139	12	12	12	5	20	12	16
5	.....	139	119	12	12	12	5	16	12	16
6	.....	139	100	12	12	12	5	16	12	16
7	.....	139	82	12	12	12	5	12	12	16
8	.....	119	65	12	12	12	5	12	12	20
9	.....	119	65	12	12	12	5	12	12	20
10	.....	139	65	12	12	12	5	12	12	20
11	.....	149	65	12	12	12	5	12	16	20
12	.....	159	65	12	12	12	5	12	16	20
13	.....	159	49	12	12	12	5	8.5	16	.....
14	.....	139	49	12	12	12	5	8.5	16	.....
15	201	119	49	12	12	12	5	8.5	16	.....
16	201	119	49	12	12	12	8	8.5	16	.....
17	222	119	49	12	12	12	44	8.5	16	.....
18	222	119	35	12	12	8.5	54	8.5	16	.....
19	222	119	35	12	12	8.5	59	8.5	16	.....
20	222	100	35	12	12	8.5	59	8.5	16	.....
21	222	100	35	12	12	8.5	59	8.5	16	.....
22	222	110	20	12	12	8.5	59	8.5	16	.....
23	222	119	20	12	12	8.5	59	8.5	16	.....
24	201	119	20	12	12	5	39	8.5	16	.....
25	201	119	20	12	12	5	29	8.5	16	.....
26	180	119	20	12	12	5	29	8.5	16	.....
27	159	119	20	12	12	5	29	8.5	16	.....
28	139	119	20	12	12	5	29	12	12	.....
29	119	119	20	12	12	5	24	12	12	.....
30	119	119	20	12	12	5	20	12	12	.....
31	119	.....	20	.....	12	5	.....	12	.....	.....

NOTE.—Discharges Mar. 15 to Dec. 14 determined from rating curves which are very well defined.

Monthly discharge of Raft River near Bridge, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 20	1,230	D.
Feb. 1–26	.....	.....	[a] 20	1,030	D.
Mar. 15–31	222	119	188	6,340	B.
April	159	100	124	7,380	B.
May	159	20	57.0	3,500	B.
June	20	12	12.7	756	C.
July	12	12	12.0	738	C.
August	12	5	9.52	585	C.
September	59	5	[b] 22.5	1,340	C.
October	20	8.5	11.6	713	B.
November	16	12	14.3	851	B.
December	.....	12	[c] 18.7	1,150	C.

NOTE.—Daily discharges Feb. 27–Mar. 14 omitted as data were of too uncertain character to warrant making estimates for publication. Gage was washed out on Mar. 1.

[a] Mean discharge Jan. 1–Feb. 26 estimated at 20 second-feet. Gage heights affected by ice.

[b] Daily discharge estimated Sept. 5–16.

[c] Mean discharge estimated Dec. 13–31 at 20 second-feet.

CLEAR CREEK NEAR NAF, IDAHO.

This station, which is located at Kempton's ranch, about 2 miles south of the Utah-Idaho State line, and about 4 miles south of Naf post office, Idaho, was established in 1909 by the Raft River Irrigation Co. Records are available from January 20, 1910.

The station is above all diversions except two small ranch ditches. Records will show practically the entire run-off from the Clear Creek drainage area available for diversion into the Raft River storage reservoir. The low-water flow of the stream is appropriated and the waters never reach Raft River except during floods.

The veritcal staff gage is on the right bank about 80 feet above the road crossing.

Discharge measurements of Clear Creek near Naf, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 15	G. C. Baldwin	7	6.5	0.65	7.5
Oct. 9	Lynn Crandall	12	4.5	.5	1.9
20	Hartwell and Searle	6	3.3	.52	2.3
Dec. 3	Lynn Crandall	12	5.3	.53	1.8
1911.					
May 18	J. C. Dort	12.5	9.5	.96	17.6
June 10	O. W. Hartwell	26	22.3	1.28	79.2

Daily gage height, in feet, of Clear Creek near Naf, Idaho, for 1910.

[Louis Desportes, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.5	0.9	0.55	0.95	1.4	0.5	0.4	0.35	0.6	0.6	0.6
2	.....	.5	.85	.6	.95	1.45	.5	.5	.4	.5	.6	.6
3	.....	.5	.75	.6	.9	1.35	.5	.4	.4	.5	.6	.6
4	.....	.5	.8	.55	.8	1.35	.4	.45	.4	.6	.65	.6
5	.....	.5	.75	.65	.85	1.1	.5	.5	.3	.6	.7	.6
6	.....	.5	.65	.75	.9	1.15	.4	.5	.4	.5	.6	.6
7	.....	.9	.6	.75	.9	1.1	.4	.5	.4	.5	.6	.5
8	.....	.6	.65	.7	.9	.9	.4	.4	.4	.6	.6	.5
9	.....	.6	.6	.75	1.0	1.0	.4	.5	.4	.5	.6	.7
10	.....	.5	.6	.9	1.4	1.0	.5	.4	.4	.5	.6	.6
11	.....	.6	.6	.95	1.45	.9	.5	.4	.4	.55	.6	.6
12	.....	.6	.6	1.0	1.55	1.0	.5	.4	.5	.6	.7	.6
13	.....	.5	.65	1.0	1.6	.9	.4	.9	.4	.6	.6	.6
14	.....	.5	.7	.85	1.55	.9	.5	.45	.5	.6	.6	.5
15	.....	.5	.7	.85	1.2	.85	.5	.4	.5	.6	.6	.8
16	.....	.5	.7	.9	1.15	.9	.5	.4	.5	.6	.5	.8
17	.....	.7	.75	.95	1.1	.9	.4	.4	.9	.6	.5	.6
18	.....	.5	.8	.9	1.15	.9	.5	.45	.7	.6	.6	.7
19	.....	.5	.85	.9	1.1	.8	.5	.4	.5	.6	.6	.6
20	0.5	.5	1.0	1.05	1.1	.9	.4	.5	.6	.6	.5	.6
21	.5	.5	1.1	1.0	1.1	.9	.2	.4	.6	.6	.6	.6
22	.6	.6	1.0	1.1	1.1	.8	.4	.4	.55	.6	.6	.5
23	.5	.6	.95	1.1	1.15	.8	.3	.3	.5	.6	.6	.5
24	.5	.5	.8	1.05	1.2	.8	.3	.4	.55	.6	.6	.5
25	.5	.5	.85	1.2	1.3	.8	.3	.4	.5	.6	.6	.8
26	.5	.5	.8	1.2	1.2	.7	.3	.4	.5	.6	.6	.8
27	.5	.5	.7	1.4	1.3	.7	.6	.35	.6	.6	.6	.7
28	.7	.6	.65	1.5	1.35	.6	.4	.4	.55	.6	.7	.6
29	.7	.....	.65	1.35	1.35	.6	.4	.3	.5	.7	.6	.6
30	.5	.....	.6	1.4	1.3	.6	.45	.4	.6	.7	.6	.6
31	.7	.....	.55	.....	1.35	.....	.4	.4	.....	.7	.....	.....

NOTE.—Relation of gage height to discharge affected by ice during January, February, and Dec. 15 to 31.

Daily discharge, in second-feet, of Clear Creek near Naf, Idaho, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	18	5	22	115	1.8	0.8	0.6	3.5	3.5	3.5
2	16	6	22	130	1.8	1.8	.8	1.8	3.5	3.5
3	11	6	18	100	1.8	.8	.8	1.8	3.5	3.5
4	13	5	13	100	.8	1.3	.8	3.5	4.8	3.5
5	11	7.5	16	36	1.8	1.8	.5	3.5	6	3.5
6	7.5	11	18	46	.8	1.8	.8	1.8	3.5	3.5
7	6	11	18	36	.8	1.8	.8	1.8	3.5	1.8
8	7.5	9	18	14	.8	.8	.8	3.5	3.5	1.8
9	6	11	27	21	.8	1.8	.8	1.8	3.5	6
10	6	18	115	21	1.8	.8	.8	1.8	3.5	3.5
11	6	22	130	14	1.8	.8	.8	2.6	3.5	3.5
12	6	27	162	21	1.8	.8	1.8	3.5	6	3.5
13	7.5	27	180	14	.8	14	.8	3.5	3.5	3.5
14	9	16	162	14	1.8	1.3	1.8	3.5	3.5	1.8
15	9	16	57	12	1.8	.8	1.8	3.5	3.5	1.5
16	9	18	46	14	1.8	.8	1.8	3.5	1.8	1.5
17	11	22	36	14	.8	.8	14	3.5	1.8	1.5
18	13	18	46	14	1.8	1.3	6	3.5	3.5	1.5
19	16	18	36	9	1.8	.8	1.8	3.5	3.5	1.5
20	27	34	36	14	.8	1.8	3.5	3.5	1.8	1.5
21	40	27	36	14	.3	.8	3.5	3.5	3.5	1.5
22	27	40	36	9	.8	.8	2.6	3.5	3.5	1.5
23	22	40	46	9	.5	.5	1.8	3.5	3.5	1.5
24	13	34	57	9	.5	.8	2.6	3.5	3.5	1.5
25	16	60	85	9	.5	.8	1.8	3.5	3.5	1.5
26	13	60	57	6	.5	.8	1.8	3.5	3.5	1.5
27	9	115	85	6	3.5	.6	3.5	3.5	3.5	1.5
28	7.5	145	100	3.5	.8	.8	2.6	3.5	6	1.5
29	7.5	100	100	3.5	.8	.5	1.8	6	3.5	1.5
30	6	115	85	3.5	1.3	.8	3.5	6	3.5	1.5
31	5	.....	100	.....	.8	.8	.....	6	.....	1.5

NOTE.—Daily discharge Mar. 1 to May 14 determined from a rating curve not well defined, derived from one discharge measurement and the shape of the next curve. Discharge May 15 to Dec. 14 computed from a rating curve not well defined, derived from discharge measurements in 1910 and 1911.

Monthly discharge of Clear Creek near Naf, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January 20-31	.....	.....	5	119	D.
February	.....	.....	5	278	D.
March	40	5	12.3	756	B.
April	145	5	34.8	2,070	C.
May	180	13	63.4	3,900	C.
June	130	3.5	27.7	1,650	C.
July	3.5	.3	1.24	76	C.
August	14	.5	1.44	89	C.
September	14	.5	2.24	133	C.
October	6	1.8	3.38	208	B.
November	6	1.8	3.62	215	B.
December	6	.....	2.32	143	D.
The period	.....	.....	.....	9,640	

NOTE.—Mean discharges January and February estimated. Discharge Dec. 15 to 31 estimated at 1.5 second-feet.

CASSIA CREEK NEAR CONANT, IDAHO.

This station, which is located at Conant's ranch, in sec. 19, T. 13 S., R. 26 E., about 1 mile above Conant post office, about 15 miles southeast of Albion, Idaho, and about 5 miles above the junction of Cassia Creek with Raft River, was established September 18, 1909.

The creek receives no tributaries below the station. All the normal low-water flow is already appropriated by ranches above the station.

The vertical staff gage is about one-eighth mile downstream from the highway bridge at Conant's ranch.

Measurements are made by wading or from a suspension gaging bridge. The gage datum has remained unchanged since the station was established.

The gage heights are somewhat affected by ice during the winter months and by shifting channel, but are not affected by artificial control above or below.

Discharge measurements of Cassia Creek near Conant, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 17	Hartwell and Purton	23	24.1	1.98	19.4
Mar. 14	G. C. Baldwin	24	44.2	2.78	126
16	do	24	44.8	2.81	128
Sept. 14	O. W. Hartwell	12	5.7	1.74	6.1
Oct. 9	Lynn Crandall	11	5.0	1.80	5.5
19	Hartwell and Searle	24	22.2	1.87	7.9
Dec. 2	Lynn Crandall	17	9.2	2.04	11.2
4	do	18	12.8	2.22	18.1

Daily gage height, in feet, of Cassia Creek near Conant, Idaho, for 1910.

[Robert Southworth, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	1.9	3.15	2.65	2.7	2.15	1.9	1.55	1.15	1.85	1.9	2.2
2	2.0	1.9	3.2	2.7	2.7	2.2	1.95	1.6	1.2	1.9	1.95	2.3
3	2.0	1.9	3.15	2.55	2.65	2.15	1.9	1.55	1.15	1.9	1.9	2.25
4	2.0	1.9	3.2	2.6	2.7	2.2	1.95	1.6	1.2	1.95	1.95	2.3
5	2.0	1.9	3.15	2.55	2.6	2.15	1.9	1.55	1.15	1.9	1.9	2.25
6	2.0	1.9	2.95	2.55	2.6	2.15	1.9	1.55	1.15	1.95	1.95	2.25
7	2.0	1.9	3.0	2.6	2.65	2.2	1.95	1.6	1.2	2.0	2.0	2.3
8	2.0	1.9	2.85	2.55	2.6	2.15	1.9	1.55	1.15	1.95	1.95	2.25
9	2.0	1.9	2.9	2.6	2.65	2.2	1.85	1.6	1.2	2.0	2.0	2.3
10	1.95	1.9	2.85	2.55	2.6	2.15	1.8	1.55	1.15	1.95	1.95	2.25
11	1.95	1.9	2.85	2.65	2.6	2.15	1.65	1.55	1.15	1.95	1.95	2.15
12	1.9	1.9	2.9	2.7	2.75	2.2	1.7	1.6	1.2	2.0	2.0	2.2
13	1.9	2.0	2.85	2.7	2.65	2.15	1.65	1.55	1.15	2.0	1.95	2.15
14	1.9	2.0	2.9	2.8	2.7	2.2	1.7	1.6	1.2	2.05	2.0	2.2
15	1.9	2.0	2.95	2.7	2.65	2.15	1.65	1.55	1.15	2.0	1.95	2.15
16	1.9	2.0	2.95	2.7	2.65	2.15	1.65	1.55	1.15	2.0	1.95	2.15
17	1.9	2.0	3.1	2.7	2.6	2.2	1.7	1.6	2.0	.....	2.0	2.2
18	2.0	1.9	3.05	2.65	2.55	2.15	1.65	1.55	1.95	.....	1.95	2.1
19	2.0	1.9	3.2	2.7	2.5	2.2	1.7	1.6	2.0	2.0	2.0	2.15
20	2.0	1.9	3.35	2.65	2.4	2.15	1.65	1.55	1.95	1.95	2.0	2.05
21	2.0	1.9	3.25	2.65	2.35	2.15	1.65	1.55	1.85	1.95	2.0	2.05
22	2.0	1.9	3.3	2.7	2.3	2.2	1.65	1.6	1.9	2.0	2.2	2.1
23	1.9	1.9	3.25	2.65	2.25	2.15	1.6	1.55	1.85	1.95	2.15	2.05
24	1.9	2.0	3.2	2.7	2.25	2.2	1.65	1.55	1.9	2.0	2.2	2.1
25	1.9	2.0	3.15	2.65	2.2	2.15	1.6	1.5	1.85	1.95	2.15	2.0
26	1.9	2.0	2.95	2.65	2.15	2.15	1.6	1.45	1.85	1.95	2.15	2.0
27	1.9	2.0	2.9	2.7	2.2	2.2	1.6	1.5	1.9	2.0	2.2	2.05
28	1.9	2.0	2.8	2.7	2.15	2.15	1.55	1.45	1.85	1.95	2.15	2.0
29	1.9	.....	2.8	2.75	2.2	1.95	1.6	1.2	1.9	2.0	2.2	2.05
30	1.9	.....	2.65	2.7	2.15	1.9	1.55	1.15	1.85	1.95	2.15	2.0
31	1.9	.....	2.65	.....	2.15	.....	1.55	1.15	.....	1.95	.....	2.0

NOTE.—Ice present to some extent during January, February, and the latter part of December. Most of the water was being used for irrigation during the summer months. Gage heights for September considered doubtful. See discharge measurement Sept. 14.

Daily discharge, in second-feet, of Cassia Creek near Conant, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	20	16	156	82	88	21	6.0	.....	.....	3.0	3.9	11
2	20	16	164	88	88	24	7.3	.....	.....	3.9	5.2	14
3	20	16	156	69	82	21	6.0	.....	.....	3.9	3.9	12
4	20	16	164	75	88	23	7.3	.....	.....	5.2	5.2	14
5	20	16	156	69	75	20	6.0	.....	.....	3.9	3.9	12
6	20	16	124	69	75	20	6.0	.....	.....	5.2	5.2	12
7	20	16	132	75	82	21	7.3	.....	.....	6.4	6.4	14
8	20	16	110	69	75	18	6.0	.....	.....	5.2	5.2	12
9	20	16	117	75	82	20	5.0	.....	.....	6.4	6.4	14
10	18	16	110	69	75	17	4.1	.....	.....	5.2	5.2	12
11	18	16	110	82	75	17	2.0	.....	.....	5.2	5.2	9.1
12	16	16	117	88	95	19	2.6	.....	.....	6.4	6.4	11
13	16	20	110	88	82	16	2.0	.....	.....	6.4	5.2	9.1
14	16	20	117	102	88	18	2.6	.....	.....	8.0	6.4	11
15	16	20	124	88	82	15	2.0	.....	.....	6.4	5.2	9.1
16	16	20	124	88	82	15	2.0	.....	.....	6.4	5.2	9.1
17	16	20	148	88	74	17	2.6	.....	8.6	6.4	6.4	11
18	20	16	140	82	67	14	2.0	.....	7.3	6.4	5.2	7.6
19	20	16	164	88	60	16	2.6	.....	8.6	6.4	6.4	9.1
20	20	16	188	82	48	14	2.0	.....	7.3	5.2	6.4	6.4
21	20	16	172	82	43	14	2.0	.....	5.0	5.2	6.4	6.4
22	20	16	180	88	38	16	2.0	.....	6.0	6.4	13	7.6
23	16	16	172	82	33	14	1.5	.....	5.0	5.2	11	6.4
24	16	20	164	88	32	16	2.0	.....	6.0	6.4	13	7.6
25	16	20	156	82	28	14	1.5	.....	5.0	5.2	11	5.2
26	16	20	124	82	24	14	1.5	.....	5.0	5.2	9.1	5.2
27	16	20	117	88	27	16	.....	.....	6.0	6.4	11	6.4
28	16	20	102	88	23	14	.....	.....	5.0	5.2	9.1	5.2
29	16	.....	102	95	26	7.3	.....	.....	6.0	6.4	11	6.4
30	16	.....	82	88	22	6.0	.....	.....	5.0	5.2	9.1	5.2
31	16	.....	82	.....	22	.....	.....	.....	.....	5.2	.....	5.2

NOTE.—Daily discharges Jan. 1–May 16 based on a rating table not well defined. Shifting channel methods used May 17–June 19. Rating tables poorly defined for remainder of year.

Monthly discharge of Cassia Creek near Conant, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	20	16	17.9	1,100	C.
February	20	16	17.4	966	C.
March	188	82	135	8,300	B.
April	102	69	82.6	4,920	B.
May	95	22	60.7	3,730	C.
June	24	6.0	16.6	988	C.
July	7.3	.....	3.19	196	D.
August	.....	.....	[a] 1.00	61.5	D.
September	8.6	.....	4.06	242	D.
October	8.0	3.0	5.60	344	B.
November	13	3.9	7.07	421	C.
December	14	5.2	9.24	568	C.
The year	188	.....	30.2	21,800	

[a] Estimated.

NOTE.—Periods July 27 to Aug. 31 and Sept. 1–12 each estimated at 1.0 second-foot. Sept. 13–16 estimated at 6.0 second-feet.

GOOSE CREEK BASIN.

Goose Creek rises on Sugar Peak, in the extreme northeastern corner of Nevada, flows southeast, east, and then in a general northeasterly course to its junction with the Snake, near Burley, in the

northern part of Cassia County, Idaho. The creek is about 70 miles long (map measurement) and receives tributaries that drain both the eastern and western slopes of the Goose Creek Mountains.

GOOSE CREEK NEAR OAKLEY, IDAHO.

This gaging station, which is located at a wagon bridge in sec. 30, T. 14 S., R. 22 E., Boise meridian, 1 mile above the Oakley dam site and about 6 miles south of Oakley, Idaho, the nearest post office, was established May 26, 1909.

Trapper Creek joins Goose Creek one-eighth mile above the station. The principal tributaries below are Birch, Basin, and Antelope creeks.

The vertical staff gage is fastened to the downstream side of the bridge, from which the discharge measurements are made.

The gage heights are somewhat affected by ice during the winter.

The gage datum has remained unchanged since the station was established.

Discharge measurements of Goose Creek near Oakley, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 9	Baldwin and Hartwell	24	125	5.72	327
Apr. 13	G. C. Baldwin	24	91	4.40	240
Aug. 11	Lynn Crandall			.8	22.2
Oct. 6	do	23	24	1.32	30
7	do	23	23	1.31	30
April 9	E. A. Porter [a]			2.34	35.2
12	do			3.05	70.4
21	do			3.01	68.4
May 13	do			2.38	42.8
21	do			2.01	31.1
June 1	do			1.62	20.1
11	do			1.45	11.4
25	do			1.30	7.23
Aug. 7	do			1.00	1.00
Oct. 19	do			1.16	2.80

[a] Measurements by Twin Falls Oakley Land & Water Co.

Daily gage height, in feet, of Goose Creek near Oakley, Idaho, for 1910.

[G. A. Lord and C. N. Higgins, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	1.3	2.75	3.3	4.7	2.0	1.1	0.9	0.8	1.25	1.5	1.55
2	2.1	1.55	2.9	3.3	4.4	1.9	1.05	.9	.8	1.25	1.5	1.55
3	2.05	2.35	3.15	3.3	4.1	1.8	1.0	.9	.8	1.25	1.5	1.55
4	2.05	2.1	4.65	3.3	3.9	1.75	1.0	.9	.85	1.25	1.55	1.55
5	2.05	2.2	6.15	3.4	3.8	1.7	1.0	.85	.9	1.25	1.5	1.5
6	1.9	1.8	6.25	3.3	3.65	1.7	1.0	.85	.9	1.25	1.5	1.55
7	2.05	1.5	5.85	3.3	3.5	1.7	1.0	.8	.9	1.25	1.5	1.5
8	2.05	1.6	5.55	3.4	3.4	1.7	1.0	.8	.9	1.25	1.5	1.5
9	2.4	1.5	5.5	3.3	3.3	1.65	1.0	.8	.9	1.3	1.45	1.5
10	2.3	1.55	4.4	3.5	3.2	1.6	.9	.8	.9	1.25	1.45	1.5
11	2.3	1.6	3.7	3.85	3.05	1.55	.8	.8	.9	1.25	1.45	1.55
12	2.2	1.3	3.5	4.2	3.05	1.55	.8	.8	.95	1.25	1.4	1.6
13	2.3	1.3	4.0	4.35	3.05	1.5	.9	.8	1.00	1.25	1.4	1.6
14	2.25	1.5	3.5	4.5	3.0	1.5	.9	.8	1.05	1.25	1.45	1.65
15	2.25	1.35	3.6	4.65	2.95	1.45	.9	.8	1.05	1.25	1.45	1.7

Daily gage height, in feet, of Goose Creek near Oakley, Idaho, for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	2.3	1.4	3.6	4.6	2.9	1.4	0.95	0.8	1.25	1.3	1.5	1.7
17	2.25	1.6	3.6	4.4	2.9	1.4	.9	.8	1.3	1.35	1.55	1.6
18	2.2	2.0	3.85	4.2	2.8	1.4	.9	.8	1.3	1.4	1.5	1.35
19	2.3	1.6	3.9	4.0	2.7	1.3	.9	.8	1.3	1.4	1.6	1.35
20	2.15	1.55	4.6	4.05	2.6	1.2	.95	.8	1.25	1.45	1.5	1.3
21	2.1	1.4	4.7	4.15	2.5	1.2	.95	.8	1.2	1.4	1.6	1.35
22	1.85	1.5	4.95	4.25	2.4	1.15	.95	.8	1.2	1.4	1.55	1.35
23	1.4	1.45	5.3	4.4	2.25	1.15	.9	.8	1.2	1.4	1.6	1.35
24	1.3	1.4	5.3	4.3	2.2	1.15	.9	.8	1.2	1.45	1.6	1.35
25	1.4	1.4	5.1	4.2	2.2	1.1	.9	.8	1.2	1.45	1.6	1.3
26	1.3	1.5	5.0	4.3	2.2	1.1	.85	.8	1.2	1.45	1.55	1.3
27	1.55	1.6	4.3	4.3	2.2	1.1	.8	.8	1.2	1.45	1.55	1.3
28	1.9	2.2	4.0	4.2	2.2	1.1	.9	.8	1.2	1.45	1.55	1.3
29	1.25	.....	3.6	4.4	2.15	1.1	1.05	.8	1.2	1.45	1.55	1.3
30	1.3	.....	3.3	4.65	2.1	1.1	1.0	.75	1.25	1.5	1.55	1.3
31	2.0	.....	3.3	.....	2.0	.....	.95	.8	.....	1.5	.....	1.3

NOTE.—Part of the flow of Trapper Creek was diverted around the gage on Goose Creek during short periods in October and November. Ice existed during the latter part of December; gage heights believed to have been only slightly affected thereby.

Daily discharge, in second-feet, of Goose Creek near Oakley, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	86	47	136	159	264	76	33	25	22	27	37	39
2	92	60	146	159	240	71	31	25	22	27	37	39
3	89	108	164	159	216	66	29	25	22	27	37	39
4	89	92	277	159	201	64	29	25	24	27	39	39
5	89	98	390	166	194	61	29	24	25	27	37	37
6	80	74	390	159	184	61	29	24	25	27	37	39
7	89	57	356	159	173	61	29	22	25	27	37	37
8	89	62	332	166	166	61	29	22	25	27	37	37
9	111	57	328	159	159	58	29	22	25	29	35	37
10	104	60	240	173	152	56	25	22	25	27	35	37
11	104	62	187	198	142	54	22	22	25	27	35	39
12	98	47	173	224	142	54	22	22	27	27	33	41
13	104	47	208	236	142	51	25	22	27	27	33	41
14	101	57	173	248	138	51	25	22	27	27	35	44
15	101	50	180	260	134	48	25	22	27	27	35	46
16	104	52	180	256	131	46	27	22	27	29	37	46
17	101	62	180	240	131	46	25	22	29	31	39	41
18	98	86	198	224	124	46	25	22	29	33	37	31
19	104	62	201	208	117	41	25	22	29	33	41	31
20	95	60	256	212	111	37	27	22	27	35	37	29
21	92	52	264	220	105	37	27	22	25	33	41	31
22	77	57	284	228	99	35	27	22	25	33	39	31
23	52	54	312	240	90	35	25	22	25	33	41	31
24	47	52	312	232	87	35	25	22	25	35	41	31
25	52	52	296	224	87	33	25	22	25	35	41	29
26	47	57	288	232	87	33	24	22	25	35	39	29
27	60	62	232	232	87	33	22	22	25	35	39	29
28	80	98	208	224	87	33	25	22	25	35	39	29
29	44	.....	180	240	84	33	31	22	25	35	39	29
30	47	.....	159	260	81	33	29	20	27	37	39	29
31	86	.....	159	.....	76	.....	27	22	.....	37	.....	29

NOTE.—Daily discharge determined from rating curves applicable as follows:

Jan. 1 to Mar. 5, from a curve based on measurements in 1909 and well defined between 30 and 60 second-feet and between 180 and 266 second-feet.

Mar. 6 to Sept. 12, from a curve based on 2 measurements in 1910 and the shape of the 1909 curve; only fairly well defined.

Sept. 13 to 15, estimated because of shift due to construction of a beaver dam below the station.

Sept. 16 to Dec. 31, from a curve based on 2 measurements in 1910; fairly well defined for the range in stage.

Monthly discharge of Goose Creek near Oakley, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	111	44	84.3	5,180	C.
February	108	47	63.7	3,540	C.
March	390	136	238	14,600	C.
April	260	159	209	12,400	B.
May	264	76	136	8,360	C.
June	76	33	48.3	2,870	B.
July	33	22	26.7	1,640	B.
August	25	20	22.5	1,380	A.
September	29	22	25.5	1,520	B.
October	37	27	30.7	1,890	B.
November	41	33	37.6	2,240	C.
December	46	29	35.4	2,180	C.
The year	390	20	80.0	57,800	

BIG COTTONWOOD CREEK BASIN.

Big Cottonwood Creek rises in the western part of Cassia County and flows northerly and northwesterly to its junction with the Snake at Murtaugh, in Twin Falls County, about 5 miles west of Milner. The creek is about 25 miles long and its tributaries are few and unimportant.

BIG COTTONWOOD CREEK NEAR OAKLEY, IDAHO.

This gaging station, which is located just above Roark's ranch, in sec. 19, T. 13 S., R. 21 E., Boise meridian, about 10 miles northwest of Oakley, the nearest post office and railway station, was established November 27, 1909.

The station is below all tributaries except Cedar Creek. One small ditch diverts water above the station during very dry years.

The staff gage is spiked to a cottonwood tree on the right bank. The datum has remained constant since the station was established.

Measurements are made by wading or from a gaging bridge.

Ice exists during the winter months, but gage heights are probably not seriously affected thereby.

Discharge measurements of Big Cottonwood Creek near Oakley, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 10	Baldwin and Hartwell	11	8.4	1.31	7.9
Apr. 12	G. C. Baldwin	13	26	3.05	68
Aug. 12	Lynn Crandall	4	1.5	.95	.76
Oct. 7	do	5	2.0	1.02	.69

Daily gage height, in feet, of Big Cottonwood Creek near Oakley, Idaho, for 1910.

[J. H. Roark, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.1	1.1	1.7	1.7	2.7	1.65	1.2	1.1	0.9	0.95	1.2	1.15
2	1.05	1.0	1.6	1.8	2.6	1.65	1.2	1.0	.9	.95	1.25	1.2
3	.8	1.0	1.4	1.9	2.5	1.6	1.2	1.0	.9	.95	1.25	1.2
4	.8	1.0	1.35	1.8	2.2	1.6	1.2	1.0	.9	1.0	1.25	1.2
5	1.0	1.0	1.4	1.9	2.3	1.55	1.2	1.0	.9	1.0	1.2	1.2
6	1.0	1.0	1.3	1.95	2.3	1.5	1.2	1.0	.9	1.05	1.2	1.2
7	1.1	1.0	1.3	1.9	2.2	1.5	1.2	1.0	.9	1.05	1.2	1.2
8	1.1	1.1	1.4	2.0	2.2	1.5	1.15	.9	.9	1.05	1.2	1.2
9	1.1	1.0	1.4	2.3	2.3	1.5	1.15	.9	.9	1.05	1.2	1.2
10	1.1	1.05	1.3	2.6	2.4	1.5	1.15	.9	.9	1.05	1.2	1.2
11	1.0	1.05	1.35	3.0	2.5	1.5	1.1	.9	.9	1.05	1.2	1.2
12	1.0	1.1	1.4	3.1	2.5	1.5	1.1	.9	.9	1.05	1.2	1.2
13	1.0	1.2	1.4	3.15	2.4	1.45	1.1	1.0	.9	1.1	1.2	1.2
14	1.1	1.2	1.4	3.0	2.4	1.4	1.1	1.0	.9	1.1	1.2	1.15
15	1.1	1.1	1.45	2.7	2.35	1.4	1.1	.95	.9	1.1	1.2	1.15
16	1.1	1.0	1.45	2.6	2.35	1.4	1.1	.95	.9	1.1	1.2	1.1
17	1.1	1.0	1.5	2.7	2.2	1.4	1.1	1.0	.9	1.15	1.2	1.1
18	1.1	1.0	1.5	2.6	2.1	1.4	1.1	.95	.9	1.15	1.2	1.05
19	1.1	1.0	1.7	2.8	2.1	1.35	1.1	.9	.9	1.15	1.2	1.1
20	1.1	1.0	2.1	3.1	2.1	1.35	1.1	.9	.9	1.15	1.2	1.05
21	1.1	1.0	2.4	3.0	2.0	1.3	1.1	.9	.9	1.15	1.2	1.1
22	1.1	1.1	2.1	3.0	2.0	1.3	1.1	.9	.9	1.15	1.2	1.05
23	1.2	1.0	2.0	3.0	1.8	1.3	1.1	.9	.9	1.15	1.2	1.1
24	1.2	1.1	2.5	3.05	1.8	1.3	1.1	.9	.9	1.2	1.2	1.1
25	1.2	1.15	2.4	3.1	1.9	1.3	1.05	.9	.95	1.2	1.2	1.1
26	1.2	1.0	2.2	3.1	1.8	1.3	1.0	.95	.95	1.2	1.2	1.0
27	1.0	1.1	2.1	2.8	1.8	1.25	1.0	.9	.95	1.2	1.1	1.1
28	1.1	2.8	2.0	2.8	1.8	1.25	1.0	.85	.95	1.2	1.15	1.1
29	1.0	.....	1.8	2.8	1.7	1.2	1.0	.8	.95	1.2	1.15	1.1
30	1.0	.....	1.	2.7	1.7	1.2	1.0	.9	.95	1.2	1.15	1.1
31	1.1	.....	1.7	.....	1.6	.....	1.0	.9	.....	1.2	.....	1.1

NOTE.—Ice existed during the winter months; gage heights apparently not seriously affected thereby. Practically entire flow was being diverted from the latter part of July to first of October.

Daily discharge, in second-feet, of Big Cottonwood Creek near Oakley, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	2.3	18.8	18.8	55	17.2	4.4	2.3	0.2	0.6	4.4	3.4
2	1.6	.9	15.7	22.0	51	17.2	4.4	.9	.2	.6	5.7	4.4
3	1.0	.9	9.8	25.5	47.0	15.7	4.4	.9	.2	.6	5.7	4.4
4	1.0	.9	8.4	22.0	36.0	15.7	4.4	.9	.2	.9	5.7	4.4
5	.9	.9	9.8	25.5	39.6	14.2	4.4	.9	.2	.9	4.4	4.4
6	.9	.9	7.0	27.2	39.6	12.7	4.4	.9	.2	1.6	4.4	4.4
7	2.3	.9	7.0	25.5	36.0	12.7	4.4	.9	.2	1.6	4.4	4.4
8	2.3	2.3	9.8	29.0	36.0	12.7	3.4	.2	.2	1.6	4.4	4.4
9	2.3	.9	9.8	39.6	39.6	12.7	3.4	.2	.2	1.6	4.4	4.4
10	2.3	1.6	7.0	51	43.3	12.7	3.4	.2	.2	1.6	4.4	4.4
11	.9	1.6	8.4	67	47.0	12.7	2.3	.2	.2	1.6	4.4	4.4
12	.9	2.3	9.8	71	47.0	12.7	2.3	.2	.2	1.6	4.4	4.4
13	.9	4.4	9.8	73	43.3	11.2	2.3	.9	.2	2.3	4.4	4.4
14	2.3	4.4	9.8	67	43.3	9.8	2.3	.9	.2	2.3	4.4	3.4
15	2.3	2.3	11.2	55	41.4	9.8	2.3	.6	.2	2.3	4.4	3.4
16	2.3	.9	11.2	51	41.4	9.8	2.3	.6	.2	2.3	4.4	2.3
17	2.3	.9	12.7	55	36.0	9.8	2.3	.9	.2	3.4	4.4	2.3
18	2.3	.9	12.7	51	32.5	9.8	2.3	.6	.2	3.4	4.4	1.6
19	2.3	.9	18.8	59	32.5	8.4	2.3	.2	.2	3.4	4.4	2.3
20	2.3	.9	32.5	71	32.5	8.4	2.3	.2	.2	3.4	4.4	1.6
21	2.3	.9	43.3	67	29.0	7.0	2.3	.2	.2	3.4	4.4	2.3
22	2.3	2.3	32.5	67	29.0	7.0	2.3	.2	.2	3.4	4.4	1.6
23	4.4	.9	29.0	67	22.0	7.0	2.3	.2	.2	3.4	4.4	2.3
24	4.4	2.3	47.0	69	22.0	7.0	2.3	.2	.2	4.4	4.4	2.3
25	4.4	3.4	43.3	71	25.5	7.0	1.6	.2	.6	4.4	4.4	2.3
26	4.4	.9	36.0	71	22.0	7.0	.9	.6	.6	4.4	4.4	.9
27	.9	2.3	32.5	59	22.0	5.7	.9	.2	.6	4.4	2.3	2.3
28	2.3	59	29.0	59	22.0	5.7	.9	.1	.6	4.4	3.4	2.3
29	.9	.....	22.0	59	18.8	4.4	.9	.0	.6	4.4	3.4	2.3
30	.9	.....	18.8	55	18.8	4.4	.9	.2	.6	4.4	3.4	2.3
31	2.3	.....	18.8	.....	15.7	.....	.9	.2	.....	4.4	.....	2.3

NOTE.—Daily discharge determined from a rating curve based on measurements in 1909 and 1910; fairly well defined. No corrections applied for possible effect of ice except Jan. 3 and 4.

Monthly discharge of Big Cottonwood Creek near Oakley, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	4.4	0.9	2.10	129	B.
February	59	.9	3.71	206	B.
March	47.0	7.0	19.1	1,170	B.
April	73	18.8	51.7	3,080	B.
May	55	15.7	34.4	2,120	B.
June	17.2	4.4	10.3	613	B.
July	4.4	.9	2.59	159	A.
August	2.3	.0	.51	31	A.
September	.6	.2	.28	17	A.
October	4.4	.6	2.68	165	A.
November	5.7	2.3	4.36	259	A.
December	4.4	.9	3.11	191	B.
The year	73	.0	11.2	8,140	

ROCK CREEK BASIN.

Rock Creek rises in the eastern part of Twin Falls County and flows in a general northerly and northwesterly direction about 30 miles to its junction with Snake River, 5 miles northwest of Twin Falls. Its principal tributary is Cottonwood Creek.

ROCK CREEK NEAR ROCK CREEK, IDAHO.

This gaging station, which is located on the ranch of E. M. Crockett, in sec. 13, T. 12 S., R. 18 E., Boise meridian, and about 3 miles above Rock Creek post office, was established November 28, 1909. It is above McMullen Creek and near a proposed diversion into Big Cottonwood Creek.

The gage is on the left bank, and is spiked to a log, from which discharge measurements are made.

Discharge measurements of Rock Creek near Rock Creek, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 12	G. C. Baldwin	20	34	1.97	85
Apr. 10	do	20	46	2.80	118
Aug. 12	Lynn Crandall	11	4.1	.38	5.5
Oct. 5	do	6	11	.50	7.5
Nov. 30	do		15	.5	13.5

Daily gage height, in feet, of Rock Creek near Rock Creek, Idaho, for 1910.

[E. M. Crockett, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.6	0.6	2.5	1.9	3.2	1.1	0.6	0.4	0.5	0.6	0.5	0.5
2	.6	.6	2.5	2.1	2.9	1.1	.6	.4	.5	.6	.5	.5
3	.5	.7	2.6	2.2	2.6	1.1	.6	.4	.5	.6	.5	.5
4	.5	1.4	2.7	2.1	2.6	1.1	.6	.4	.5	.6	.5	.6
5	.4	1.0	2.8	2.1	2.6	1.1	.6	.4	.5	.5	.5	.6
6	.4	.7	2.6	2.1	2.6	1.0	.6	.4	.5	.5	.5	.5
7	.4	.7	2.6	2.1	2.4	1.0	.5	.3	.5	.5	.5	.5
8	.4	.7	2.4	2.2	2.1	1.0	.5	.3	.5	.5	.6	.5
9	.4	.7	2.3	2.4	2.1	1.0	.5	.3	.5	.5	.6	.6
10	.4	.6	2.2	2.8	2.3	1.0	.5	.3	.5	.5	.6	.6
11	.4	.6	2.1	3.4	2.4	.9	.5	.3	.6	.5	.6	.6
12	.4	.6	2.1	3.7	2.3	.9	.5	.3	.6	.5	.6	.6
13	.4	.8	2.1	3.8	2.4	.9	.5	.4	.6	.5	.6	.6
14	.4	.8	2.1	3.6	2.3	.9	.5	.4	.6	.5	.7	.5
15	.4	.7	2.2	3.3	2.1	.9	.5	.4	.6	.5	.7	.5
16	.4	.6	2.3	3.1	2.1	.9	.5	.4	.7	.6	.6	.5
17	.4	.6	2.5	2.9	2.0	.9	.5	.4	.6	.6	.5	.5
18	.5	.6	2.7	2.8	1.9	.8	.5	.4	.6	.6	.6	.5
19	.6	.6	3.2	2.9	1.8	.8	.4	.4	.6	.6	.6	.5
20	.6	.6	3.7	3.2	1.7	.8	.4	.4	.6	.6	.6	.5
21	.6	.6	4.1	3.4	1.7	.8	.4	.4	.6	.6	.6	.5
22	.6	.7	4.4	3.4	1.6	.8	.4	.4	.6	.6	.6	.5
23	.7	.8	4.3	3.4	1.4	.7	.4	.4	.6	.6	.6	.5
24	.8	.8	4.0	3.6	1.4	.7	.4	.5	.5	.6	.6	.5
25	.7	.9	4.3	3.9	1.5	.7	.4	.5	.5	.6	.6	.5
26	.7	.9	3.0	3.6	1.4	.7	.4	.5	.5	.6	.6	.5
27	.7	2.5	2.6	3.7	1.3	.7	.4	.5	.5	.6	.6	.5
28	.7	3.2	2.4	3.7	1.3	.7	.4	.5	.5	.5	.6	.5
29	.7	.....	2.2	3.7	1.2	.7	.4	.5	.5	.5	.6	.5
30	.7	.....	2.0	3.8	1.2	.6	.4	.5	.5	.5	.5	.5
31	.7	.....	1.9	.....	1.1	.....	.4	.5	.....	.5	.....	.4

Daily discharge, in second-feet, of Rock Creek near Rock Creek, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	20	20	111	71	139	32	11.2	5.6	8.4	11.2	10	14
2	20	20	111	81	121	32	11.2	5.6	8.4	11.2	10	14
3	16	24	116	86	106	32	11.2	5.6	8.4	11.2	10	14
4	16	56	121	81	106	32	11.2	5.6	8.4	11.2	10	18
5	12	36	127	81	106	32	11.2	5.6	8.4	8.4	11	18
6	12	24	116	81	106	28	11.2	5.6	8.4	8.4	11	14
7	12	24	116	81	96	28	8.4	3.6	8.4	8.4	11	14
8	12	24	106	86	81	28	8.4	3.6	8.4	8.4	14	14
9	12	24	101	96	81	28	8.4	3.6	8.4	8.4	14	18
10	12	20	96	116	91	28	8.4	3.6	8.4	8.4	14	18
11	12	20	91	151	96	23	8.4	3.6	11.2	8.4	15	18
12	12	20	91	169	91	23	8.4	3.6	11.2	8.4	15	18
13	12	28	91	175	96	23	8.4	5.6	11.2	8.4	15	18
14	12	28	91	163	91	23	8.4	5.6	11.2	8.4	19	14
15	12	24	96	145	81	23	6.4	5.6	11.2	8.4	19	14
16	12	20	101	133	81	23	8.4	5.6	14	12	15	14
17	12	20	111	121	76	23	8.4	5.6	11.2	12	12	14
18	16	20	121	116	71	18	8.4	5.6	11.2	12	15	14
19	20	20	151	121	66	18	5.6	5.6	11.2	12	16	14
20	20	20	181	139	61	18	5.6	5.6	11.2	12	16	14
21	20	20	205	151	61	18	5.6	5.6	11.2	12	16	14
22	20	24	211	151	56	18	5.6	5.6	11.2	12	16	14
23	24	28	205	151	46	14	5.6	5.6	11.2	12	16	14
24	28	28	187	163	46	14	5.6	8.4	8.4	13	16	14
25	24	32	205	181	51	14	5.6	8.4	8.4	13	17	14
26	24	32	127	163	46	14	5.6	8.4	8.4	13	17	14
27	24	111	106	169	41	14	5.6	8.4	8.4	13	17	14
28	24	151	96	169	41	14	5.6	8.4	8.4	10	17	14
29	24	.....	86	169	36	14	5.6	8.4	8.4	10	17	14
30	24	.....	76	175	36	11.2	5.6	8.4	8.4	10	14	14
31	24	.....	71	.....	32	.....	5.6	8.4	.....	10	.....	10.6

NOTE.—Daily discharge determined from three rating curves, none of them very well defined, derived from measurements in 1909 and 1910. Discharge Oct. 16 to Nov. 29 computed by indirect method for shifting channels.

Monthly discharge of Rock Creek near Rock Creek, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	28	12	17.5	1,080	C.
February	151	20	32.8	1,820	C.
March	211	71	123	7,560	B.
April	181	71	131	7,800	B.
May	139	32	75.3	4,630	C.
June	32	11.2	22.0	1,310	C.
July	11.2	5.6	7.77	478	B.
August	8.4	3.6	5.94	365	A.
September	14	8.4	9.71	578	A.
October	13	8.4	10.5	646	B.
November	19	10	14.5	863	C.
December	18	10.6	14.8	910	B.
The year	211	3.6	38.7	28,000	

M'MULLEN CREEK BASIN.

McMULLEN CREEK NEAR ROCK CREEK, IDAHO.

This station, which is located at the Burr ranch in sec. 8, T. 12 S, R. 18 E, Boise meridian; near Rock Creek post office and about 11 miles south of Kimberly, was established March 31 and discontinued November 12, 1910.

The site is about 2 miles above the mouth of the canyon and above all diversions on the stream. The records show the water supply available for a proposed Carey Act project. There was practically no flow in the stream during the summer of 1910.

The records were obtained from a vertical staff gage.

Discharge measurements were made by wading.

Discharge measurements of McMullen Creek near Rock Creek, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 31	G. C. Baldwin	12	12.8	1.35	12.3
Apr 14	do	12.5	12.3	1.40	14.6
Oct. 5	Lynn Crandall			.71	[a] .2
Nov. 30	do	6.0	2.0	.79	.56

[a] Estimated.

Daily gage height, in feet, and discharge, in second-feet, of McMullen Creek near Rock Creek, Idaho, for 1910.

[Theodore Burr, observer.]

Day.	April.		May.		June.		October.		November.	
	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge
1	1.5	19	1.1	4.8	0.8	0.7	.....	.....	0.7	0.2
2	1.75	32	1.1	4.8	.8	.7	.....	.....	.7	.2
3	1.8	34	1.1	4.8	.8	.7	.....	.....	.7	.2
4	1.55	22	1.1	4.8	.8	.7	.....	.....	.7	.2
5	1.35	12.5	1.1	4.8	.8	.7	.....	.....	.7	.2
6	1.35	12.5	1.1	4.8	.8	.7	.....	.....	.7	.2
7	1.35	12.5	1.1	4.8	.8	.7	.....	.....	.7	.2
8	1.35	12.5	1.0	3.0	.8	.7	.....	.....	.7	.2
9	1.4	14.6	1.0	3.0	.75	.4	.....	.....	.7	.2
10	1.4	14.6	1.0	3.0	.75	.4	.....	.....	.7	.2
11	1.5	19	1.0	3.0	.75	.4	.....	.....	.7	.2
12	1.5	19	1.0	3.0	.7	.2	.....	.....	.7	.2
13	1.45	16.8	1.0	3.0	.7	.2	.....	.....	.....	.....
14	1.4	14.6	.95	2.2	.7	.2	.....	.....	.....	.....
15	1.35	12.5	.95	2.2	.7	.2	.....	.....	.....	.....
16	1.3	10.4	.9	1.5	.7	.2	0.7	0.2	.....	.....
17	1.3	10.4	.95	2.2	.7	.2	.7	.2	.....	.....
18	1.25	8.9	.9	1.5	.7	.2	.7	.2	.....	.....
19	1.2	7.4	.9	1.5	.7	.2	.7	.2	.....	.....
20	1.2	7.4	.9	1.5	.7	.2	.7	.2	.....	.....
21	1.2	7.4	.9	1.5	.7	.2	.7	.2	.....	.....
22	1.2	7.4	.9	1.5	.7	.2	.7	.2	.....	.....
23	1.15	6.1	.9	1.5	.7	.2	.7	.2	.....	.....
24	1.1	4.8	.9	1.5	.7	.2	.7	.2	.....	.....
25	1.1	4.8	.85	1.1	.7	.2	.7	.2	.....	.....
26	1.1	4.8	.85	1.1	.7	.2	.7	.2	.....	.....
27	1.1	4.8	.8	.7	.7	.2	.7	.2	.....	.....
28	1.2	7.4	.8	.7	.7	.2	.7	.2	.....	.....
29	1.15	6.1	.8	.7	.7	.2	.7	.2	.....	.....
30	1.1	4.8	.8	.7	.....	.0	.....	.2	.....	.....
31	.....	.....	.8	.7	.....	.....	.....	.2	.....	.....

NOTE.—Water was standing in pools from June 30 to Oct. 15.
Daily discharges were computed from a rating curve fairly well defined below 19 second-feet.

Monthly discharge of McMullen Creek near Rock Creek, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accu-racy.
	Maximum.	Minimum.	Mean.		
April	34	4.8	12.4	736	B.
May	4.8	.7	2.45	151	B.
June	.7	.0	.35	21	B.
July	.0	.0	.0	.0	
August	.0	.0	.0	.0	
September	.0	.0	.0	.0	
October	.2	.0	.10	6.1	B.
Nov. 1–12	.2	.2	.2	4.8	B.
The period	.....	.....	.....	919	

SALMON FALLS RIVER BASIN.

Salmon Falls River rises in the northern part of Elko County, Nev., flows in a general southerly direction for about 25 miles, then turns abruptly and flows irregularly northward to its junction with Snake River, near Austin, in the northwestern part of Twin Falls County, Idaho. It is about 100 miles long.

SALMON FALLS RIVER NEAR SAN JACINTO, NEV.

This station, which is located in sec. 23, T. 47 N., R. 64 E., Mount Diablo meridian, about 7 miles north of the San Jacinto ranch and about 20 miles south (by road) of Salmon dam, was established September 17, 1909, to take the place of the station established earlier in the year at the Salmon dam site 15 miles below, as the latter station will be flooded out by backwater from the dam now under construction. The records of this new station give practically the same data as those obtained at the lower station.

Shoshone Creek enters the river just above the station and Cedar Creek about 30 miles below.

A vertical staff gage on the right bank at the entrance to the canyon and about 350 feet downstream from the mouth of Shoshone Creek was read from September 17, 1909, to June 30, 1910. On June 5, 1910, a Friez automatic gage was installed below the staff gage by the Twin Falls Salmon River Land & Water Co. There is no determined relation between the two gages.

Discharge measurements are made by wading or from a cable and car located at the automatic gage. Insufficient measurements were obtained to develop a rating curve for the old staff-gage heights.

Discharge measurements of Salmon Falls River near San Jacinto, Nev., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 11	Hartwell and Farrar	44	35.2	2.49	33.4
Oct. 3	Lynn Crandall	30	50	[a] 2.60	47
Nov. 27[b]	do	48	41	2.66	37
1911.					
Apr. 15	P. W. Farrar			3.46	186
16	A. B. Purton	52	87	3.48	196
May 25	J. C. Dort	52	98	3.72	267
June 15	do	54	111	3.97	309
July 26	H. L. Stoner	36	33.0	2.54	34.5
Aug. 23	do	27	16.5	2.34	18.5
1910.	Twin Falls Salmon River Land & Water Co.:				
June 5	R. J. Newell			3.75	245
18	do			3.05	105
25	do			2.85	85.4
July 2	do			2.67	60.8
9	do			2.55	45.7
23	do			2.53	42.8
30	do			2.44	31.8
Aug. 6	do			2.40	25.7
13	do			2.38	24.2
27	—— Gilbert			2.38	25.4
Sept. 17	P. W. Farrar			2.58	45.7

[a] Old staff gage read 1.38 feet. [b] Ice on edges of stream.

NOTE.—The gage heights of these measurements are referred to the datum of the automatic gage.

Daily gage height, in feet, of Salmon Falls River near San Jacinto, Nev., for 1910.

[Leonard Boyle, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	1.2	1.25	3.65	3.5	4.3	2.9	16	.....	1.25	3.65	4.6	3.6	1.85
2	1.3	.....	3.8	3.5	4.3	2.75	17	1.2	1.25	3.8	4.2	3.4	1.8
3	1.2	.....	3.8	3.9	4.15	.....	18	.....	1.3	3.7	3.9	3.35	.....
4	.....	.....	3.05	3.8	4.2	.....	19	1.2	1.3	4.15	3.8	3.25	.....
5	.....	.....	2.9	3.8	4.1	2.65	20	1.25	1.3	4.6	3.65	3.2	1.7
6	1.15	1.3	2.75	3.8	3.9	2.55	21	1.2	1.3	5.4	3.55	3.2	1.7
7	1.05	1.35	2.6	3.65	3.7	2.5	22	1.2	1.35	6.1	3.75	3.2	1.5
8	1.05	1.3	2.4	3.7	3.55	2.4	23	1.25	1.3	5.85	3.85	3.2	1.4
9	1.15	1.3	2.2	3.65	3.5	2.35	24	1.3	1.35	5.7	4.05	3.2	1.4
10	.....	1.35	2.45	3.8	3.5	2.2	25	1.2	1.35	5.55	3.9	3.2	.....
11	1.15	1.4	2.3	4.1	3.5	2.0	26	1.2	1.35	5.05	3.95	3.2	1.4
12	1.15	1.3	2.35	4.4	3.7	1.95	27	.....	1.4	4.9	4.0	3.2	1.4
13	.....	1.3	.....	.....	3.7	1.85	28	1.5	2.55	5.45	4.1	3.15	1.35
14	1.2	1.3	3.3	4.65	3.75	1.8	29	1.4	.....	4.2	4.1	3.15	1.35
15	1.1	1.3	3.45	4.6	3.65	1.8	30	1.25	.....	3.8	4.3	3.1	1.35
							31	1.2	.....	3.6	.....	3.0	.....

NOTE.—These gage heights were read on the staff gage established Sept. 17, 1909.

[Automatic gage.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.69	2.43	2.41	2.60	2.72	2.77	16	3.03	2.53	2.37	2.54	2.67	2.75	2.71
2	.....	2.68	2.42	2.42	2.62	2.72	2.77	17	3.05	2.53	2.36	2.61	2.67	2.75	2.74
3	.....	2.63	2.40	2.40	2.62	2.73	2.78	18	3.05	2.54	2.36	2.58	2.67	2.77	2.80
4	.....	2.62	2.39	2.40	2.62	2.73	2.79	19	3.01	2.53	2.35	2.57	2.67	2.78	.....
5	.....	2.63	2.39	2.40	2.63	2.72	.....	20	.....	.....	2.35	2.53	2.66	2.78	.....
6	3.68	2.62	2.38	2.41	2.63	2.72	.....	21	.....	2.54	2.36	2.52	2.66	2.78	.....
7	3.62	2.60	2.38	2.41	2.63	2.72	.....	22	.....	2.55	2.35	2.54	2.66	2.78	.....
8	3.56	2.58	2.38	2.42	2.64	2.73	2.77	23	.....	2.52	2.35	2.55	2.72	2.79	.....
9	3.51	2.57	2.38	2.43	.....	2.73	2.79	24	2.82	2.47	2.35	2.55	2.72	2.81	.....
10	3.45	2.55	2.38	2.43	2.62	2.75	2.85	25	2.80	2.45	2.36	2.58	2.72	2.81	.....
11	3.35	2.53	2.38	.....	2.62	2.75	2.88	26	2.79	2.43	2.37	2.58	2.72	2.72	.....
12	3.28	3.53	2.38	2.49	2.62	2.76	2.87	27	2.77	2.43	2.38	2.58	2.71	2.70	.....
13	3.22	2.52	2.38	2.49	2.62	2.76	2.86	28	2.74	2.43	2.38	2.59	2.71	2.78	.....
14	3.14	.....	2.37	2.49	2.63	2.76	2.84	29	2.72	2.43	2.38	2.59	2.71	2.77	2.70
15	3.09	2.53	2.37	.....	2.64	2.76	2.79	30	2.70	2.42	2.39	2.59	2.71	2.77	2.72
								31	.....	2.41	2.40	.....	2.72	.....	2.68

NOTE.—Records were probably affected to some extent by the presence of ice during latter part of November and December.

Daily discharge, in second-feet, of Salmon Falls River near San Jacinto, Nev., for 1910.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	57	30	29	46	61	67	16	105	39	26	40	54	64	59
2	.....	56	30	30	48	61	67	17	108	39	25	47	54	64	63
3	.....	50	28	28	48	62	68	18	108	40	25	44	54	67	71
4	.....	48	27	28	48	62	70	19	102	39	24	43	54	68	70
5	.....	50	27	28	50	61	70	20	96	40	24	39	53	68	69
6	232	48	26	29	50	61	69	21	90	40	25	38	53	68	67
7	218	46	26	29	50	61	68	22	84	41	24	40	53	68	65
8	206	44	26	30	51	62	67	23	79	38	24	41	61	70	64
9	195	43	26	30	50	62	70	24	74	34	24	41	61	72	63
10	182	41	26	30	48	64	78	25	71	32	25	44	61	72	62
11	162	39	26	32	48	64	82	26	70	30	26	44	61	61	61
12	148	39	26	35	48	66	81	27	67	30	26	44	59	58	60
13	137	38	26	35	48	66	79	28	63	30	26	45	59	68	59
14	123	38	26	35	50	66	77	29	61	30	26	45	59	67	59
15	114	39	26	38	51	66	70	30	58	30	27	45	59	67	61
								31	.....	29	28	.....	61	.....	56

NOTE.—Daily discharge determined from a rating curve well defined, derived from measurements made during 1910 and 1911. Discharge estimated or interpolated on days on which gage height was not recorded.

Monthly discharge of Salmon Falls River near San Jacinto, Nev., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 6-30	232	58	118	5,850	B.
July	57	29	39.9	2,450	B.
August	30	24	26.0	1,600	B.
September	47	28	36.9	2,200	B.
October	61	46	53.2	3,270	B.
November	72	58	64.9	3,860	C.
December	82	.....	64.9	3,860	D.
The period	.....	.....	.....	23,000	

NOTE.—Mean discharge Dec. 17-31, estimated at 50 second-feet.

SALMON FALLS RIVER NEAR TWIN FALLS, IDAHO.

This station, which is located about 35 miles south of Twin Falls and about three-fourths of a mile upstream from the Salmon dam, was established May 31, 1909.

Shoshone Creek enters the river about 15 miles above the station and Cedar Creek enters about 15 miles below.

The cable equipment from which measurements are made at ordinary and high stages is just upstream from the highway bridge on the road from the Salmon dam to Cedar Creek. Low-water measurements are made by wading. A vertical staff gage is located on the left bank about 15 feet upstream from the cable.

The flow was affected by ice during the winter months, but not by artificial control above or below until in May, 1910. The dam was being built during 1910, and the station was flooded out on May 29.

The gage datum remained unchanged during the life of the station. A good rating curve was obtained, and the records during the open-water season may be considered reliable.

The following discharge measurement was made by G. C. Baldwin:

March 21, 1910: Width, 46 feet; area, 171 square feet; gage height, 2.44 feet; discharge, 576 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of Salmon Falls River near Twin Falls, Idaho, for 1910.

[T. R. Nowell, observer.]

Day.	March.		April.		May.		Day.	March.		April.		May.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.45	993	2.25	518	2.65	667	16	1.7	340	2.9	766	2.2	500
2	4.9	1,650	2.1	466	2.7	686	17	1.8	370	2.85	746	2.3	536
3	4.45	1,440	2.1	466	2.65	667	18	1.85	385	2.7	686	2.3	536
4	3.25	909	2.2	500	2.55	629	19	2.0	432	2.55	629	2.15	483
5	2.25	518	2.3	536	2.55	629	20	2.1	466	2.6	648	2.0	432
6	1.7	340	2.3	536	2.6	648	21	2.4	572	2.55	629	1.9	400
7	1.5	286	2.25	518	2.45	591	22	2.9	766	2.4	572	1.8	370
8	1.3	236	2.2	500	2.3	536	23	3.7	1,100	2.45	591	1.75	355
9	1.25	224	2.2	500	2.2	500	24	4.45	1,440	2.5	610	1.65	326
10	1.25	224	2.2	500	2.05	449	25	4.5	1,460	2.4	572	1.6	311
11	1.3	236	2.3	536	2.0	432	26	4.25	1,350	2.35	554	1.6	311
12	1.3	236	2.4	572	2.0	432	27	3.85	1,170	2.35	554	1.6	311
13	1.3	236	2.6	648	2.1	466	28	3.35	951	2.4	572	1.6	311
14	1.4	261	2.7	686	2.1	466	29	3.0	806	2.5	610	.....	.....
15	1.6	311	2.85	746	2.2	500	30	2.7	686	2.6	648	.....	.....
							31	2.4	572	.....	.....	.....	.....

NOTE.—Ice present during January and February.
Daily discharge determined from a rating curve fairly well defined below 800 second-feet.

Monthly discharge of Salmon Falls River near Twin Falls, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	45	2,770	D.
February	.....	.....	40	2,220	D.
March	1,650	224	676	41,600	B.
April	766	466	587	34,900	B.
May 1-28	686	311	481	26,700	B.

NOTE.—Mean discharge for January and February estimated because of presence of ice.

CEDAR CREEK NEAR ROSEWORTH, IDAHO.

This station, which is located in sec. 12, T. 14 S., R. 13 E., Boise meridian, about 10 miles south of Roseworth, the nearest post office, about 25 miles south of Buhl, the nearest railway point, and about 7 miles west of Salmon Falls dam, was established May 30, 1909.

Cedar Creek joins Salmon Falls River about 12 miles below the station. House Creek, the main source of supply, enters about 2½ miles above.

The staff gage is about 100 feet above the intake of the West End Twin Falls Irrigation Co.'s tunnel and immediately upstream from the Cedar Creek dam site at Butte, and about 1 mile downstream from the entrance to the canyon.

Discharge measurements are made from a plank across the stream at the gage.

There is said to be some gain from seepage between this station and House Creek. When the Cedar Creek dam is completed this station will be flooded out by backwater and new stations will have to be established on Cedar Creek and House Creek above their junction.

The relation between gage height and discharge was probably not seriously affected by ice, and during 1910 there was no effect from artificial control above or below.

Discharge measurements of Cedar Creek near Roseworth, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 21	G. C. Baldwin	18	54	3.56	78
Sept. 12	O. W. Hartwell	15	14	2.13	13
Oct. 2	Lynn Crandall	16	17	2.22	17
Nov. 28	do	15	19	2.28	19

Daily gage height, in feet, of Cedar Creek near Roseworth, Idaho, for 1910.

[C. D. Snyder and H. B. Collings, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	2.0	.....	2.75	3.15	2.35	2.05	2.0	1.9	2.15	2.2	2.25
2	2.0	1.9	4.75	2.9	3.1	2.4	2.1	2.15	1.95	2.25	2.25	2.3
3	2.0	1.9	4.8	3.0	2.85	2.35	2.05	2.05	1.9	2.25	2.2	2.25
4	1.9	1.9	4.65	2.9	3.15	2.4	2.1	2.1	1.95	2.3	2.25	2.3
5	1.9	1.9	4.35	2.85	3.4	2.35	2.0	2.15	2.05	2.25	2.2	2.25
6	1.9	1.9	3.55	3.05	3.55	2.35	2.0	2.0	2.1	2.25	2.2	2.25
7	2.0	1.85	3.65	3.0	3.7	2.4	2.05	2.05	2.1	2.25	2.3	2.3
8	2.0	1.85	3.65	3.0	3.55	2.25	2.1	2.1	2.08	2.2	2.25	2.25
9	2.0	1.9	3.55	3.0	3.45	2.3	2.1	2.1	2.12	2.25	2.3	2.5
10	2.0	1.9	3.45	3.15	3.45	2.25	2.05	2.15	2.08	2.2	2.25	2.45
11	2.0	1.9	3.35	3.25	3.35	2.25	2.05	2.1	2.05	2.2	2.25	2.55
12	1.9	1.9	3.4	3.4	3.3	2.3	2.1	2.15	2.1	2.25	2.3	2.5
13	1.9	1.9	3.3	3.35	3.25	2.25	2.05	2.05	2.05	2.2	2.25	2.3
14	1.9	1.9	3.4	3.4	3.2	2.3	2.1	2.1	2.1	2.25	2.3	2.3
15	2.0	1.85	3.35	3.2	3.15	2.25	2.1	2.05	2.1	2.2	2.2	2.15
16	2.0	1.85	3.3	3.05	3.05	2.25	2.05	2.05	2.15	2.25	2.2	2.15
17	2.0	1.9	3.35	3.0	3.1	2.4	2.15	2.1	2.2	2.3	2.3	2.2
18	2.0	1.9	3.4	2.95	2.95	2.35	2.1	1.95	2.2	2.25	2.25	2.15
19	2.05	1.95	3.5	2.95	2.9	2.3	2.2	1.95	2.3	2.3	2.25	2.1
20	2.05	1.95	3.6	2.95	2.75	2.25	2.05	2.0	2.2	2.25	2.2	2.05
21	2.05	1.95	3.65	3.0	2.75	2.2	2.05	2.0	2.15	2.25	2.3	2.15
22	2.15	1.95	3.7	3.05	2.7	2.25	2.1	2.0	2.2	2.3	2.3	2.2
23	2.55	1.95	3.65	2.95	2.6	2.15	2.05	1.9	2.15	2.25	2.35	2.05
24	2.7	2.0	3.55	2.95	2.7	2.2	2.1	1.95	2.2	2.3	2.4	2.1
25	2.4	2.0	3.4	2.95	2.6	2.1	2.1	1.9	2.15	2.25	2.35	2.05
26	2.15	2.0	3.35	2.9	2.65	2.0	2.05	1.9	2.15	2.25	2.15	2.05
27	2.1	2.0	3.3	3.0	2.7	2.0	2.05	1.85	2.2	2.25	2.2	2.1
28	2.1	3.2	3.2	3.05	2.55	2.0	2.1	1.9	2.15	2.2	2.25	2.0
29	2.1	.....	3.0	3.45	2.6	2.05	2.05	1.95	2.2	2.25	2.4	2.1
30	2.1	.....	2.85	3.2	2.45	1.95	2.0	1.9	2.15	2.2	2.3	2.25
31	2.0	.....	2.8	.....	2.35	.....	1.95	1.85	.....	2.2	.....	2.05

NOTE.—Water over gage on Mar. 1.

Daily discharge, in second-feet, of Cedar Creek near Roseworth, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	16	16	200	38	54	18	12	11	9	16	17	19
2	16	14	140	44	52	20	13	14	10	18	18	20
3	16	14	143	48	42	18	12	12	9	18	17	20
4	14	14	134	44	54	20	13	13	10	19	18	21
5	14	14	116	42	67	18	11	14	12	18	17	20
6	14	14	74	50	74	18	11	11	13	18	17	20
7	16	13	80	48	82	20	12	12	13	18	19	22
8	16	13	80	48	74	16	13	13	12	17	18	21
9	16	14	74	48	70	17	13	13	13	18	19	26
10	16	14	70	54	70	16	12	14	12	17	18	25
11	16	14	64	60	64	16	12	13	12	17	18	28
12	14	14	67	67	62	17	13	14	13	18	19	27
13	14	14	62	64	60	16	12	12	12	17	18	21
14	14	14	67	67	57	17	13	13	13	18	19	22
15	16	13	64	57	53	16	13	12	13	17	17	18
16	16	13	62	50	49	16	12	12	14	18	17	19
17	16	14	64	48	51	20	14	13	16	19	19	20
18	16	14	67	46	44	18	13	10	16	18	18	19
19	17	15	72	46	42	17	15	10	18	19	18	18
20	17	15	77	46	36	16	12	11	16	18	17	17
21	17	15	80	48	35	15	12	11	15	18	19	19
22	19	15	82	50	33	16	13	11	16	19	19	20
23	30	15	80	46	29	14	12	9	15	18	21	17
24	36	16	74	46	32	15	13	10	16	19	22	18
25	26	16	67	46	28	13	13	9	16	18	21	17
26	19	16	64	44	30	11	12	9	16	18	16	17
27	18	16	62	48	31	11	12	8	17	18	17	18
28	18	57	57	50	25	11	13	9	16	17	18	16
29	18	.....	48	70	27	12	12	10	17	18	22	18
30	18	.....	42	57	22	10	11	9	16	17	19	21
31	16	.....	40	.....	19	.....	10	8	.....	17	.....	17

NOTE.—Discharge on Mar. 1 estimated. Fairly well defined rating tables derived. Shifting channel methods used May 15–31, Sept. 13–Oct. 1, Dec. 1–15.

Monthly discharge of Cedar Creek near Roseworth, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	36	14	17.6	1,080	B.
February	57	13	15.9	883	B.
March	[a] 200	40	79.8	4,910	C.
April	70	38	50.7	3,020	B.
May	82	19	47.4	2,910	B.
June	20	10	15.9	946	B.
July	15	10	12.4	762	B.
August	14	8	11.3	695	B.
September	18	9	13.9	827	B.
October	19	16	17.8	1,090	B.
November	22	16	18.4	1,090	B.
December	28	16	20.0	1,230	B.
The year	[a] 200	8	26.9	19,400	

[a] Estimated.

BIG WOOD RIVER BASIN.

Big Wood (Malade) River rises near Galena Peak, in the northern part of Blaine County, Idaho, and flows southward and southwestward to its junction with Snake River in the western part of Lincoln County. It is about 100 miles long and drains an area of about 4,500 square miles in extent. It receives a number of tributaries, the most important being Camas Creek and Little Wood River.

BIG WOOD RIVER NEAR SHOSHONE, IDAHO.

This station, which is located at A. D. Silva's ranch, in sec. 17, T. 5 S., R. 17 E., Boise meridian, 1 mile below the steel wagon bridge and 7 miles northwest of Shoshone, Idaho, was established June 5, 1905, discontinued December 31, 1906, and reestablished March 7, 1908.

The records of this station show the total amount of water available for storage in the reservoir constructed by the Idaho Irrigation Co. about 23 miles above. The principal tributaries are Camas Creek, which enters about 26 miles above the station, and Little Wood River, entering about 15 miles below.

During the winter months the records are affected by ice. They are not affected by artificial control below, but during the irrigating season practically the total flow of the river is diverted above.

The staff gage is on the right bank, about 300 feet below the cable. During the fall of 1910 a private wagon bridge was built just above the gage and the previous relation of gage height to discharge may be slightly affected thereby. The gage datum has remained unchanged since the station was established.

The channel is permanent and a very good rating curve has been obtained.

Discharge measurements of Big Wood River near Shoshone, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 5[a]	Hartwell and Purton	80	81	3.62	73
Mar. 19	O. W. Hartwell	94	386	5.74	1,320
21	do	93	666	8.33	3,760
July 29[b]	Lynn Crandall			2.18	23

[a] Measurement under ice cover. [b] By wading 900 feet upstream.

Daily gage height, in feet, of Big Wood River near Shoshone, Idaho, for 1910.

[A. D. Silva, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.2	3.8	4.1	6.8	5.5	4.6	4.1	2.1	.....	2.5	2.4	2.5
2	2.8	3.7	4.0	6.7	5.6	4.8	3.9	2.1	.....	2.6	2.35	2.5
3	3.4	3.8	4.1	6.6	5.7	5.2	3.2	2.1	.....	2.4	2.3	2.5
4	3.5	3.7	4.2	6.5	5.8	5.2	2.5	1.9	.....	2.45	2.25	2.55
5	3.7	3.8	4.1	6.4	5.7	4.9	2.2	1.8	.....	2.55	2.25	2.55
6	3.5	3.85	4.0	6.3	5.6	4.5	3.0	1.7	.....	2.7	2.25	2.6
7	3.5	3.85	3.9	6.2	5.5	4.5	3.0	1.6	.....	2.7	2.2	2.65
8	3.4	3.8	3.9	6.1	5.35	4.15	3.0	1.5	.....	2.7	2.2	2.7
9	3.35	3.7	3.8	6.0	5.2	4.0	2.8	.....	.....	2.7	2.1	2.75
10	3.35	3.8	3.7	5.8	4.4	3.8	2.8	.....	.....	2.65	2.1	2.8
11	3.4	3.7	3.6	5.9	4.4	3.5	2.8	.....	.....	2.6	2.1	2.9
12	3.25	3.7	3.9	5.9	4.25	3.6	2.65	.....	2.4	2.55	2.2	2.9
13	3.1	3.65	4.0	5.9	4.15	3.7	2.8	.....	2.3	2.5	2.2	2.85
14	3.15	3.6	4.1	5.9	4.0	3.7	2.8	.....	2.2	2.5	2.45	2.85
15	3.3	3.55	4.0	5.9	3.85	3.7	2.7	.....	2.25	2.5	2.45	2.85
16	3.2	3.6	4.5	5.9	3.9	3.75	2.65	.....	2.3	2.5	2.45	2.7
17	3.2	3.6	4.9	6.0	3.9	3.5	2.65	.....	2.5	2.55	2.4	2.5
18	3.3	3.6	5.4	6.0	3.8	3.4	2.6	.....	2.55	2.55	2.4	2.5
19	3.3	3.6	5.6	6.0	4.0	3.3	2.65	.....	2.6	2.6	2.4	2.5
20	3.2	3.45	6.8	5.9	5.1	3.3	2.75	.....	2.6	2.6	2.4	2.5
21	3.15	3.55	8.25	5.9	4.8	3.2	2.7	.....	2.55	2.6	2.4	2.5
22	3.3	3.55	8.65	6.0	4.6	3.2	2.7	.....	2.65	2.6	2.45	2.5
23	3.4	3.7	8.85	6.0	4.5	3.15	2.55	.....	2.7	2.6	2.45	2.5
24	3.4	3.8	8.9	5.9	4.65	3.1	2.55	.....	2.65	2.6	2.5	2.7
25	3.35	3.9	8.95	5.95	4.8	2.95	2.55	.....	2.5	2.6	2.5	2.7
26	3.5	4.0	8.8	6.05	5.0	2.75	2.5	.....	2.5	2.6	2.5	2.5
27	3.6	4.0	8.65	6.1	5.3	2.55	2.5	.....	2.4	2.6	2.5	2.5
28	3.6	4.1	8.6	6.0	5.2	2.35	2.1	.....	2.55	2.6	2.5	2.5
29	5.1	.....	8.4	5.9	5.0	4.2	2.2	.....	3.0	2.4	2.5	2.5
30	4.65	.....	7.9	5.6	4.8	5.5	2.15	.....	2.5	2.4	2.5	2.4
31	2.4	.....	7.0	.....	4.65	.....	2.25	.....	.....	2.4	.....	2.4

NOTE.—Relation of gage height to discharge affected by presence of ice during January, most of February, and the latter part of December.

Water standing in pools Aug. 9 to Sept. 11; no gage heights during this period.

Daily discharge, in second-feet, of Big Wood River near Shoshone, Idaho, for 1910.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	480	2,100	1,180	685	480	17	0	55	43	55
2	.....	445	2,020	1,240	790	410	17	0	69	38	55
3	.....	480	1,940	1,300	1,010	195	17	0	43	33	55
4	.....	515	1,860	1,360	1,010	55	6	0	49	29	62
5	.....	480	1,780	1,300	845	25	3	0	62	29	62
6	.....	445	1,710	1,240	635	145	1	0	85	29	69
7	.....	410	1,640	1,180	635	145	0	0	85	25	77
8	.....	410	1,570	1,090	498	145	0	0	85	25	85
9	.....	375	1,500	1,010	445	103	0	0	85	17	94
10	.....	340	1,360	590	375	103	0	0	77	17	103
11	.....	310	1,430	590	280	103	0	0	69	17	123
12	.....	410	1,430	532	310	77	0	43	62	25	123
13	.....	445	1,430	498	340	103	0	33	55	25	113
14	.....	480	1,430	445	340	103	0	25	55	49	113
15	.....	445	1,430	392	340	85	0	29	55	49	113
16	.....	635	1,430	410	358	77	0	33	55	49	85
17	.....	845	1,500	410	280	77	0	55	62	43	55
18	.....	1,120	1,500	375	250	69	0	62	62	43	55
19	.....	1,240	1,500	445	220	77	0	69	69	43	55
20	.....	2,100	1,430	955	220	94	0	69	69	43	55
21	.....	3,590	1,430	790	195	85	0	62	69	43	.....
22	.....	4,070	1,500	685	195	85	0	77	69	49	.....
23	340	4,310	1,500	635	182	62	0	85	69	49	.....
24	375	4,370	1,430	710	170	62	0	77	69	55	.....
25	410	4,430	1,460	790	134	62	0	55	69	55	.....
26	445	4,250	1,540	900	94	55	0	55	69	55	.....
27	445	4,070	1,570	1,060	62	55	0	43	69	55	.....
28	480	4,010	1,500	1,010	38	17	0	62	69	55	.....
29	.....	3,770	1,430	900	515	25	0	145	43	55	.....
30	.....	3,190	1,240	790	1,180	21	0	55	43	55	.....
31	.....	2,280	.....	710	.....	29	0	.....	43	.....	.....

NOTE.—Daily discharge determined from a rating curve well defined above 20 second-feet.

Monthly discharge of Big Wood River near Shoshone, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	50	3,070	D.
February	480	.....	144	8,000	C.
March	4,430	310	1,770	109,000	A.
April	2,100	1,240	1,550	92,200	A.
May	1,360	375	823	50,600	A.
June	1,180	38	421	25,100	A.
July	480	17	104	6,400	A.
August	17	0	2.0	123	C.
September	145	0	37.8	2,250	B.
October	85	43	64.2	3,950	A.
November	55	17	39.9	2,370	A.
December	123	.....	67.8	4,170	C.
The year	4,430	0	424	307,000	

NOTE.—Mean discharge for January, and Feb. 1 to 22 and Dec. 21 to 31 estimated because of ice. Mean for Feb. 1 to 22, 70 second-feet; mean for Dec. 21–31, 45 second-feet.

LITTLE CANYON CREEK BASIN.

Little Canyon Creek, a stream about 20 miles long, joins Snake River from the north at Glenns Ferry.

LITTLE CANYON CREEK AT GLENNS FERRY, IDAHO.

This gaging station, which is located in the western part of the town of Glenns Ferry, Idaho, at the highway bridge on the road from Glenns Ferry to Hammett, just above the crossing of the Oregon Short Line Railroad, in sec. 30, T. 5 S., R. 10 E., Boise meridian, was established November 20, 1909, and has been maintained in cooperation with the Kings-Hill Extension Irrigation Co.

The staff gage is attached to the bridge, from which discharge measurements are made at high stages. Measurements at low water are made by wading. The accuracy of records during the summer and fall is affected by a temporary diversion dam below the gage. No reliable estimates are possible for 1909.

The station was discontinued April 30, 1910, and reestablished January 25, 1911. The Kings-Hill Extension Irrigation Co. has furnished records of daily discharge for November 22 to December 31, 1910.

Discharge measurements of Little Canyon Creek at Glenns Ferry, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 11	Hartwell and Purton	26	21	0.88	9.5
12	.....do	25	21	.87	8.8
Mar. 3	G. C. Baldwin	28	76	2.65	[a] 294
4	Jack Gossett	28	69	2.3	163
4	O. W. Hartwell	28	64	2.30	162
15	Hartwell and Gossett	24	69	2.01	119
May 28	O. W. Hartwell	11	4.3	.68	3.8
Nov. 11	Lynn Crandall	.....	.....	.35	[b] .6

[a] Discharge is probably at least 20 per cent too great owing to meter being held 0.8 foot above proper point in vertical for each velocity observation.
[b] Discharge estimated.

Daily gage height, in feet, of Little Canyon Creek at Glenns Ferry, Idaho, for 1910.

[R. C. Gossett, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr.
1	0.9	1.0	2.9	1.4	16	1.0	1.4	2.0	1.5
2	1.0	1.2	2.8	1.4	17	.9	.8	1.9	1.4
3	1.5	.8	2.7	1.4	18	.9	.9	2.0	1.4
4	1.5	.8	2.3	1.5	19	.8	1.0	2.2	1.4
5	1.3	1.4	2.1	1.4	20	.8	.9	2.2	1.4
6	1.3	.9	2.1	1.4	21	.8	.9	2.2	1.4
7	.9	.9	1.8	1.4	22	.9	.8	2.0	1.4
8	.9	.9	2.1	1.4	23	1.0	.9	1.9	1.4
9	1.2	.9	1.9	1.4	24	3.0	.9	1.9	1.4
10	1.2	.9	1.9	1.5	25	1.8	.9	1.9	1.4
11	1.2	.9	1.8	1.5	26	1.5	.9	1.8	1.4
12	1.2	.9	1.8	1.5	27	1.3	1.0	1.6	1.4
13	1.4	.8	1.9	1.6	28	1.2	3.4	1.6	1.4
14	1.2	.9	2.1	1.6	29	1.2	.....	1.5	1.4
15	1.1	.8	2.0	1.5	30	1.0	.....	1.5	1.4
					31	1.1	.....	1.5	.....

NOTE.—Records affected by presence of ice Jan. 1 to 16, Feb. 2 to 5, and Feb. 16.

Daily discharge, in second-feet, of Little Canyon Creek at Glenns Ferry, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	Nov.	Dec.	Day.	Jan.	Feb.	Mar.	Apr.	Nov.	Dec.
1	10	15	283	45	.....	6.5	16	10	7	118	55	.....	8.0
2	10	10	261	45	.....	6.0	17	10	7	104	45	.....	7.0
3	10	10	240	45	.....	7.0	18	10	10	118	45	.....	5.0
4	10	10	163	55	.....	10.0	19	7	15	147	45	.....	5.0
5	10	10	132	45	.....	10.0	20	7	10	147	45	.....	4.0
6	10	10	132	45	.....	8.0	21	7	10	147	45	.....	4.0
7	10	10	90	45	.....	6.5	22	10	7	118	45	8.0	4.0
8	10	10	132	45	.....	6.5	23	15	10	104	45	9.0	4.0
9	10	10	104	45	.....	6.5	24	306	10	104	45	8.0	4.0
10	10	10	104	55	.....	7.0	25	90	10	104	45	7.0	3.0
1	10	10	90	55	.....	12.0	26	55	10	90	45	6.5	3.0
2	10	10	90	55	.....	14.0	27	35	15	66	45	6.0	3.0
3	10	7	104	66	.....	12.0	28	27	402	66	45	6.5	3.0
9	10	10	132	66	.....	10.0	29	27	.....	55	45	6.0	3.0
10	10	7	118	55	.....	9.0	30	15	.....	55	45	6.0	1.5
							31	21	.....	55	.....	.....	1.5

NOTE.—Daily discharges Jan. 1 to Apr. 30 were computed from a rating which is fairly well defined. Discharges estimated Jan. 1 to Jan. 16, Feb. 2 to 5, and Feb. 16. Daily discharges for Nov. 22 to Dec. 31 were furnished by the Kings-Hill Extension Irrigation Co.

Monthly discharge of Little Canyon Creek at Glenns Ferry, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	306	7	25.9	1,590	B.
February	402	7	24.0	1,330	B.
March	283	55	122	7,500	B.
April	66	45	48.4	2,880	B.
November 22-30	9.0	6.0	7.00	125	
December	14	1.5	6.26	385	

ALKALI CREEK BASIN.

Alkali Creek, a stream about 12 miles long, rises in the southern part of Elmore County and flows southward into Snake River about 4 miles west of Glenns Falls.

ALKALI CREEK NEAR GLENNS FERRY, IDAHO.

This gaging station, which is located in sec. 27, T. 5 S., R. 9 E., Boise meridian, about 200 yards above the ford on the road from Glenns Ferry to Hammett, and a short distance above the point at which the creek is crossed by the tracks of the Oregon Short Line Railroad, was established November 20, 1909, and has been maintained in cooperation with the Kings-Hill Extension Irrigation Co.

The gage is a staff placed on the right bank. It was washed out on February 28, 1910, and replaced at approximately the same location and datum. The station was discontinued April 23, 1910, and reestablished at a different location January 25, 1911.

Discharge measurements are made by wading. The determinations of daily discharge for December, 1910, have been furnished by the Kings-Hill Extension Irrigation Co.

Because of shifting channel, presence of ice, change in gages, and lack of discharge measurements, the records for the winter periods are roughly approximate.

Discharge measurements of Alkali Creek near Glenns Ferry, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 12	Hartwell and Purton	10.5	5.2	0.19	1.8
Mar. 3	G. C. Baldwin	23	82.7	1.7	112
4	do	31	25	1.5	50
15	Hartwell and Gossett	11	6.3	.93	4.2

Daily gage height, in feet, of Alkali Creek near Glenns Ferry, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr.
1	0.1	0.3	3.3	0.8	16	0.3	0.15	0.9	0.7
2	.1	.3	2.6	.8	17	.2	.1	.9	.6
3	.4	.3	2.2	.8	18	.2	.1	.9	.6
4	.4	.2	1.5	.8	19	.2	.1	.9	.7
5	.3	.2	1.3	.8	20	.2	.1	.9	.6
6	.3	.2	1.3	.8	21	.2	.1	.9	.6
7	.....	.2	1.1	.8	22	.2	.1	.9	.6
8	.....	.2	1.1	.7	23	1.0	.1	.9	.6
9	.....	.2	1.0	.7	24	1.7	.1	.9	.....
10	.....	.2	1.0	.7	25	1.1	.2	.9	.....
11	.....	.2	1.0	.7	26	.7	.5	.9	.....
12	.....	.2	1.0	.7	27	.7	.6	.8	.....
13	.....	.2	1.0	.7	28	.6	1.7	.9	.....
14	.....	.2	.9	.7	29	.5	.....	.8	.....
15	.1	.5	.9	.7	30	.4	.....	.8	.....
					31	.3	.....	.8	.....

NOTE.—Ice existed at the station during portions of January and February. The periods during which the records are believed to have been affected are Jan. 3 to 22, Jan. 30 to Feb. 7, and Feb. 15 to 16.

Daily discharge, in second-feet, of Alkali Creek near Glenns Ferry, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	Dec.	Day.	Jan.	Feb.	Mar.	Apr.	Dec.
1	0.8	2	1,100	2	0.0	16	2	1	4	0.8	3.0
2	.8	2	630	2	.0	17	1	.8	4	.4	3.0
3	2	2	370	2	.5	18	1	.8	4	.4	.5
4	2	1	50	2	.0	19	1	.8	4	.8	.5
5	1	1	24	2	.0	20	1	.8	4	.4	.5
6	1	1	24	2	.0	21	1	.8	4	.4	.5
7	.5	1	11	2	.0	22	1	.8	4	.4	.5
8	.5	2	11	.8	.0	23	74	.8	4	.4	.5
9	.5	2	7	.8	.0	24	435	.8	4	.....	.5
10	.3	2	7	.8	0	25	110	2	4	.....	.0
11	.3	2	7	.8	.5	26	24	11	4	.....	.0
12	.3	2	7	.8	.0	27	24	16	2	.....	.0
13	.3	2	7	.8	.0	28	16	435	4	.....	.0
14	.3	2	4	.8	.0	29	11	.....	2	.....	.0
15	.5	3	4	.8	2.0	30	2	.....	2	.....	.0
						31	2	.....	2	.....	.0

NOTE.—Daily discharge Jan. 2 to 22, Jan. 30 to Feb. 7, Feb. 15–16, and Mar. 1, estimated. Discharge Jan. 1 to Apr. 23, were computed from rating curves which are very poorly defined. Determinations of daily discharge for December, 1910, were furnished by Kings-Hill Extension Irrigation Co.

Monthly discharge of Alkali Creek near Glenns Ferry, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	435	.....	23.1	1,420	D.
February	435	.....	17.8	989	D.
March	.....	2	74.8	4,600	D.
April 1–23	2	.4	1.06	48	C.
December	3.0	.0	.40	24.6	

COLD SPRING CREEK BASIN.

Cold Spring Creek, a stream about 25 miles long, joins Snake River from the north in the southern part of Elmira County, about 8 miles west of Glenns Ferry.

COLD SPRING CREEK NEAR HAMMETT,[1] IDAHO.

This gaging station, which is located at the highway bridge on the road from Hammett railroad station, just north of the tracks of the Oregon Short Line Railroad in sec. 31, T. 5 S., R. 9 E., Boise meridian, and about 3 miles east of Hammett, Idaho, was established November 20, 1909, and has been maintained in cooperation with the Kings-Hill Extension Irrigation Co.

The gage is nailed to the bridge, from which discharge measurements are made, except during low water, when they are made by wading. The gage was washed out March 1, 1910, but replaced at approximately the same location and datum. The gage was again destroyed in April, 1910, and the station was not reestablished until January 26, 1911. The determinations of daily discharge for March 22 to December 31, 1910, were furnished by the Kings-Hill Extension Irrigation Co.

[1] Post office formerly known as Medbury.

Discharge measurements of Cold Spring Creek near Hammett, Idaho, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 11	Hartwell and Purton	15	10	0.45	11
12	do	15	10	.43	11
Mar. 3	G. C. Baldwin	21	44	2.2	182
4	Jack Gossett	21	44	2.2	172
15	Hartwell and Gossett	21	32	1.65	93
May 28	O. W. Hartwell	6	1	(a)	.48

a Gage destroyed on Apr. 23, 1910.

Daily gage height, in feet, of Cold Spring Creek near Hammett, Idaho, for 1910.

[R. C. Gossett, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr
1	0.1	0.7	4.8	1.3	16	0.1	0.6	1.65	1.3
2	.1	.6	2.3	1.3	17	.1	.4	1.6	1.3
3	.7	.6	2.2	1.3	18	.1	.4	1.6	1.3
4	.7	.8	2.2	1.3	19	.1	.4	1.75	1.2
5	.5	.9	2.2	1.3	20	.1	.4	1.8	1.2
6	.5	.7	1.9	1.2	21	.1	.4	2.0	1.2
7	.....	.7	1.8	1.2	22	.3	.4	1.8	1.2
8	.....	.6	1.8	1.2	23	.3	.4	1.7	1.2
9	.....	.6	1.7	1.2	24	2.2	.4	1.7	.....
10	.....	.4	1.7	1.3	25	1.3	.5	1.65	.....
11	.....	.5	1.6	1.4	26	1.0	.9	1.60	.....
12	.....	.4	1.6	1.4	27	.9	.9	1.40	.....
13	.....	.5	1.6	1.4	28	.9	3.7	1.45	.....
14	.....	.4	1.6	1.3	29	.6	.....	1.40	.....
15	.1	.5	1.6	1.2	30	.7	.....	1.30	.....
					31	.7	.....	1.30	.....

NOTE.—Records affected by presence of ice Jan. 1 to 23, Feb. 3 to 5, Feb. 15 to 16, and possibly on other days during January and February.

Daily discharge, in second-feet, of Cold Spring Creek near Hammett, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	Nov.	Dec.	Day.	Jan.	Feb.	Mar.	Apr.	Nov.	Dec.
1	2	20	650	55	.....	2.0	16	2	7	93	55	.....	2.0
2	2	16	194	55	.....	2.0	17	2	9	87	55	.....	2.0
3	2	15	177	55	.....	3.0	18	2	9	87	55	.....	1.0
4	2	15	177	55	.....	5.0	19	2	9	106	47	.....	1.0
5	2	15	177	55	.....	4.0	20	2	9	113	47	.....	1.0
6	2	20	127	47	.....	3.0	21	2	9	144	47	.....	1.0
7	2	20	113	47	.....	2.5	22	2	9	113	47	2.0	1.0
8	2	16	113	47	.....	2.5	23	2	9	99	47	3.0	1.0
9	2	16	99	47	.....	2.0	24	177	9	99	.....	2.5	1.0
10	2	9	99	55	.....	3.0	25	55	12	93	.....	2.0	.5
11	2	12	87	65	.....	3.5	26	35	30	87	.....	2.0	.5
12	2	9	87	65	.....	4.0	27	30	30	65	.....	2.0	.5
13	2	12	87	65	.....	3.0	28	30	465	70	.....	2.0	.5
14	2	9	87	55	.....	1.0	29	16	.....	65	.....	2.0	.5
15	2	7	87	47	.....	2.0	30	20	.....	55	.....	2.5	.0
							31	20	.....	55	.....	.....	.0

NOTE.—Discharge estimated Jan. 1 to 23, Feb. 3 to 5, 15 to 16, 28, and Mar. 1. Discharges Jan. 1 to April 23, were computed from a rating curve fairly well defined below 200 second-feet. Discharge Nov. 22 to Dec. 31, published as furnished by the Kings Hill Extension Irrigation Co.

Monthly discharge of Cold Spring Creek near Hammett, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	177	.....	13.9	855	D.
February	465	7	29.5	1,640	C.
March	.....	55	122	7,500	B.
Apr. 1–23	65	47	52.8	2,410	B.
Nov. 22–30	3	2	2.22	39.6	
December	5	0	1.81	111	

BENNETT CREEK BASIN.

Bennett Creek rises in the southern part of Elmira County and flows southward into Snake River about 12 miles west of Glenns Ferry. It is about 25 miles long.

BENNETT CREEK NEAR HAMMETT,[1] IDAHO.

This gaging station, which is located at the highway bridge, about 2 miles west of Hammett, Idaho, and about one-half mile west of the tracks of the Oregon Short Line Railroad in sec. 27, T. 5 S., R. 8 E., Boise meridian, was established November 20, 1909, and has been maintained in cooperation with the Kings Hill Extension Irrigation Co.

The staff gage is attached to the bridge, from which discharge measurements are made at medium and high stages. Measurements at low water are made by wading. The gage was destroyed on February 27 and later replaced at the same location but with a different datum. The gage was again destroyed some time in May, 1910. The station was reestablished on January 23, 1911, on a new bridge at practically the same location but with a different datum.

The determination of discharge March 22 to December 31, 1910, was furnished by the Kings Hill Extension Irrigation Co.

Discharge measurements of Bennett Creek near Hammett, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 11	Hartwell and Purton	10	7	0.45	14
12	.....do	9	6	.43	12
Mar. 15	Hartwell and Gossett	20	59	4.15	149
May 28	O. W. Hartwell	3.5	.65	(a)	.44

[a] No gage.

[1] Post office formerly called Medbury.

Daily gage height, in feet, of Bennett Creek near Hammett, Idaho, for 1910.

[R. C. Gossett, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr.
1	0.3	0.6	7.0	2.3	16	0.4	0.35	4.0	1.7
2	.2	.5	7.0	2.4	17	.3	.3	3.8	1.7
3	.6	.6	5.8	2.3	18	.3	.2	3.8	1.7
4	.6	.4	4.8	2.3	19	.4	.3	4.0	1.6
5	.5	.5	5.6	2.2	20	.4	.2	4.2	1.6
6	.3	.5	4.4	2.2	21	.4	.3	4.0	1.6
7	.3	.5	4.4	2.2	22	.4	.0	3.5	1.6
8	.3	.4	4.4	2.1	23	.6	.3	3.5	1.5
9	.3	.4	4.2	2.0	24	4.1	.3	3.5	1.5
10	.4	.4	4.0	1.9	25	2.0	.3	3.1	1.5
11	.3	.4	3.8	1.9	26	1.0	1.6	2.9	1.5
12	.3	.4	3.8	1.8	27	1.0	7.0	2.9	1.4
13	.3	.4	3.8	1.8	28	1.0	6.5	2.75	1.4
14	.3	.4	4.0	1.7	29	.6	.....	2.7	1.4
15	.3	.35	4.0	1.7	30	.5	.....	2.7	1.4
					31	.6	.....	2.3	.....

NOTE.—Ice existed in the stream during part of January, and apparently affected the records for Jan. 2 to 23.

Daily discharge, in second-feet, of Bennett Creek near Hammett, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	Nov.	Dec.	Day.	Jan.	Feb.	Mar.	Apr.	Nov.	Dec.
1	9	19	420	15	.....	4.5	16	5	10	136	3.5	.....	5.0
2	7	15	420	19	.....	4.0	17	5	9	118	3.5	.....	4.0
3	5	19	300	15	.....	5.0	18	5	7	118	3.5	.....	2.5
4	5	11	208	15	.....	8.9	19	5	9	136	2.5	.....	2.5
5	5	15	285	12	.....	8.0	20	5	7	154	2.5	.....	2.5
6	5	15	172	12	.....	7.0	21	5	9	136	2.5	.....	2.5
7	5	15	172	12	.....	6.5	22	5	4	93	2.5	5.0	2.5
8	5	11	172	10	.....	7.5	23	5	9	93	1.5	5.0	2.5
9	5	11	154	8	.....	6.5	24	340	9	93	1.5	5.0	2.5
10	5	11	136	6	.....	7.0	25	116	9	62	1.5	4.0	1.5
11	5	11	118	6	.....	8.0	26	42	84	48	1.5	3.5	1.5
12	5	11	118	4.5	.....	9.0	27	42	420	48	1.0	3.5	1.5
13	5	11	118	4.5	.....	7.0	28	42	365	38	1.0	4.0	1.5
14	5	11	136	3.5	.....	5.5	29	19	.....	35	1.0	4.0	1.5
15	5	10	136	3.5	.....	5.5	30	15	.....	35	1.0	4.5	1.5
							31	19	.....	15	.....	.....	1.5

NOTE.—Daily discharge Jan. 1 to Apr. 30, 1910, excepting for the period Jan. 2 to 23, determined from rating curves not well defined. The high-discharge figures were obtained by extending the curve and are very roughly approximate. Discharge Jan. 2 to 23 estimated, as relation between gage height and discharge was affected by ice. Determinations of daily discharge Nov. 22 to Dec. 31 furnished by the Kings Hill Extension Irrigation Co.

Monthly discharge of Bennett Creek near Hammett, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	340	5	24.4	1,500	D.
February	420	4	41.0	2,280	D.
March	420	15	143	8,790	C.
April	15	1.0	5.88	350	C.
November 22–30	5.0	3.5	4.28	76.4	
December	9.0	1.5	4.39	270	

BRUNEAU RIVER BASIN.

GENERAL FEATURES.

Bruneau River rises in northern Nevada, flows in a general northerly direction, and enters Snake River in Owyhee County, Idaho. Its basin is of a rolling character and is devoted to stock raising. Systematic measurements on this river have been maintained by Andrew J. Wiley for the Owyhee Land & Irrigation Co., immediately below the headworks of its canal system, 10 miles east of Grandview, Idaho.

BRUNEAU RIVER NEAR TINDALL, IDAHO.

This station, which is located on unsurveyed land at the Gedney & Jones ranch, formerly known as the Manuel Triguero ranch, about 20 miles south of Tindall, was established August 18, 1910.

Jarbidge River, Sheep, Marys, and Louse creeks, and East Fork of Bruneau River enter Bruneau River between this station and the station at Hot Springs, Idaho. On some maps this stream is named West Fork of Bruneau River and Jarbidge River is called Bruneau River.

The equipment consists of a car and cable and an inclined and vertical staff gage. The gage datum has remained constant.

Discharge measurements are made from the cable or by wading.

The channel appears to be permanent.

The relation of gage height and discharge is not affected by ice.

Discharge measurements of Bruneau River near Tindall, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 18	O. W. Hartwell	31	27	0.2	14
Sept. 18	Lynn Crandall	36	23	.28	22
19	do	37	24	.27	22
Dec. 19	do	37	32	.52	38
1911.					
Mar. 27	O. W. Hartwell	40	66	1.49	202
May 5	A. B. Purton	42	102	2.28	388
June 6	H. L. Stoner	40	84	1.85	270
July 3	do	35	43	.85	92.4
Sept. 7	Lynn Crandall	34	15	.05	10.8

Daily gage height, in feet, and discharge, in second-feet, of Bruneau River near Tindall, Idaho, for 1910.

[L. W. Allen, observer.]

Day.	August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			0.2	16	0.2	16	0.4	30	0.3	22
2			.2	16	.2	16	.3	22	.3	22
3			.2	16	.4	30	.3	22	.3	22
4					.4	30	.3	22	.3	22
5					.4	30	.3	22	.3	22
6					.4	30	.3	22	.3	22
7					.4	30	.3	22	.3	22
8					.4	30	.3	22	.3	22
9					.4	30	.3	22	.4	30
10					.4	30	.3	22	.4	30
11					.4	30	.3	22	.5	39
12					.4	30	.3	22	.5	39
13					.4	30	.3	22	.5	39
14					.4	30	.2	16	.5	39
15					.5	39	.2	16	.5	39
16			.3	22	.5	39	.2	16	.5	39
17			.3	22	.6	50	.2	16	.5	39
18	0.2	16	.3	22	.6	50	.3	22	.5	39
19	.2	16	.3	22	.6	50	.3	22	.5	39
20	.2	16	.2	16	.6	50	.3	22	.5	39
21	.2	16	.2	16	.6	50	.3	22	.6	50
22	.2	16	.3	22	.6	50	.3	22	.3	22
23	.2	16	.4	30	.4	30	.3	22	.3	22
24	.2	16	.4	30	.4	30	.4	30	.4	30
25	.2	16	.2	16	.4	30	.4	30	.5	39
26	.2	16	.2	16	.4	30	.5	39	.5	39
27	.2	16	.2	16	.4	30	.5	39	.4	30
28	.2	16	.2	16	.4	30	.5	39	.5	39
29	.2	16	.2	16	.4	30	.5	39	.4	30
30	.2	16	.2	16	.4	30	.5	39	.4	30
31	.2	16			.4	30			.4	30

NOTE.—No observations Sept. 4 to 15.

Daily discharge determined for a rating curve derived from measurements in 1910 and 1911; curve fairly well defined for the range of stage in 1910. Discharge Sept. 4 to 15 estimated by means of local information as to stage of river.

Monthly discharge of Bruneau River near Tindall, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
August 18–31	16	16	16.0	444	B.
September	30		16.3	970	C.
October	50	16	33.5	2,060	B.
November	39	16	24.8	1,480	B.
December	50	22	31.8	1,960	B.

NOTE.—Mean discharge Sept. 4 to 15 estimated at 12 second-feet.

BRUNEAU RIVER NEAR HOT SPRING, IDAHO.

This station, which is located at Dunham's ranch, in sec. 34, T. 7 S., R. 6 E., Boise meridian, about 2 miles upstream from the Hot Spring post office, was established July 3, 1909.

The principal tributaries above are Jarbidge River, which enters the Bruneau about 35 miles upstream; East Fork, which comes in about 15 miles above; and Hot Creek, which is tributary, about one-half mile above the station. No important tributaries enter the river between the station and Snake River, about 20 miles below, except Jack and Wickahoney creeks.

The original vertical staff gage was located about one-fourth mile above Dunham's farmhouse, on the right bank and about 600 feet below the cable station. The gage and cable were destroyed by a flood on March 2, 1910. A new gage was installed on March 12 about one-eighth mile below the first site, and a new cable was erected at the new gage May 27. Discharge measurements have been made by wading or from the cables.

The gage heights are not affected by ice or by artificial control above or below.

Discharge measurements of Bruneau River near Hot Spring, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 8	Hartwell and Purton	88	101	[a] 2.41	211
May 27	O. W. Hartwell	88	267	5.82	1,060
July 22	Hartwell and Crandall	79	102	3.75	109
22	.....do	79	102	3.75	111
Aug. 12	O. W. Hartwell	78	86	3.53	77
Sept. 9	Lynn Crandall	72	78	3.51	64
13	.....do	77	77	3.48	60
20	.....do	77	85	3.59	76
Dec. 13	.....do	78	125	4.13	202
21	.....do	78	103	3.77	118
1911.					
Feb. 9	Lynn Crandall	79	109	3.95	162
Mar. 30	O. W. Hartwell	87	226	5.29	782
Apr. 29	A. B. Purton	87	248	5.55	910
May 1	.....do	86	228	5.29	778
7	.....do	92	292	6.00	1,240
June 4	H. L. Stoner	87	290	5.95	1,190
July 5	.....do	79	166	4.6	433
Sept. 3	Lynn Crandall	76	70	3.47	62

[a] Gage height refers to original gage.

Daily gage height, in feet, of Bruneau River near Hot Spring, Idaho, for 1910.

[W. N. Dunham, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	2.5	10.6	5.5	6.5	5.9	4.2	3.6	3.5	.....	3.7	3.9
2	2.5	2.9	.....	5.6	6.4	5.8	4.1	3.6	3.5	3.5	3.7	3.9
3	2.4	2.5	.....	5.9	6.0	5.7	4.1	3.6	3.5	3.6	3.7	3.8
4	2.4	2.3	.....	5.9	6.0	5.6	4.1	3.6	3.5	3.6	3.7	3.8
5	2.1	2.0	.....	5.8	6.1	5.4	4.1	3.6	3.5	3.6	3.7	3.8
6	1.9	1.9	.....	5.7	6.1	5.3	4.1	3.5	3.5	3.6	3.7	3.9
7	1.9	2.1	.....	5.9	6.6	5.3	3.9	3.5	3.5	3.6	3.7	3.9
8	2.0	2.4	.....	5.8	6.9	5.2	3.9	3.5	3.5	3.6	3.7	3.9
9	2.6	2.5	.....	5.8	6.9	5.1	3.9	3.5	3.5	3.6	3.7	3.9
10	2.5	2.5	.....	6.8	6.6	5.0	3.9	3.5	3.5	3.6	3.7	3.9
11	2.5	2.5	.....	6.2	6.6	4.9	3.9	3.5	3.5	3.6	3.7	4.0
12	2.5	2.5	5.6	6.5	6.3	4.9	3.9	3.5	3.5	3.6	3.7	4.0
13	2.4	2.6	5.6	6.6	6.6	4.9	3.8	3.5	3.5	3.6	3.7	4.1
14	2.4	3.0	5.8	6.5	6.7	4.9	3.8	3.5	3.5	3.6	3.7	4.1
15	2.2	2.9	5.9	6.2	6.6	4.8	3.8	3.5	3.5	3.6	3.7	4.1
16	2.4	2.5	6.1	6.0	6.6	4.7	3.8	3.5	3.5	3.6	3.7	3.9
17	2.4	2.1	6.2	5.9	6.2	4.7	3.8	3.5	3.5	3.6	3.8	3.8
18	2.4	2.5	6.5	5.9	6.1	4.7	3.8	3.5	3.5	3.7	3.7	3.9
19	2.4	2.5	6.7	6.0	6.0	4.6	3.8	3.5	3.5	3.7	3.8	3.9
20	2.2	2.5	7.0	6.0	6.0	4.6	3.8	3.5	3.5	3.8	3.8	3.8
21	2.3	2.4	7.6	6.2	5.9	4.5	3.8	3.5	3.5	3.7	3.8	3.8
22	2.4	2.4	7.7	6.1	5.8	4.5	3.8	3.5	3.5	3.7	3.8	3.8
23	2.4	2.4	7.7	6.0	5.8	4.4	3.7	3.5	3.5	3.7	3.8	3.7
24	3.5	2.5	7.2	6.0	5.9	4.4	3.7	3.5	3.5	3.7	3.9	3.7
25	4.6	3.8	6.7	6.2	5.9	4.3	3.7	3.5	3.5	3.7	3.9	3.7
26	4.0	3.8	6.6	6.5	5.9	4.3	3.7	3.4	3.5	3.7	4.0	3.8
27	3.0	3.4	6.2	6.5	5.8	4.3	3.7	3.4	3.5	3.7	3.9	3.8
28	2.9	4.9	6.2	6.5	5.8	4.3	3.6	3.5	3.5	3.7	3.8	3.7
29	2.8	.....	5.9	6.6	5.7	4.2	3.6	3.5	3.5	3.7	3.9	3.7
30	2.9	.....	5.8	6.6	5.8	4.2	3.6	3.5	3.5	3.7	3.9	3.8
31	2.6	.....	5.5	.....	5.9	.....	3.6	3.5	.....	3.7	.....	3.8

NOTE.—Gage heights to Mar. 1 refer to original gage; those after Mar. 12 to new gage established on that date. The flood of Mar. 1 reached a maximum stage of about 13 feet on the new gage.

Daily discharge, in second-feet, of Bruneau River near Hot Spring, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	202	236	5,660	904	1,570	1,160	236	82	65	65	101	145
2	236	402	2,800	966	1,500	1,100	202	82	65	65	101	145
3	202	236	2,800	1,160	1,230	1,030	202	82	65	82	101	122
4	202	170	2,700	1,160	1,230	966	202	82	65	82	101	122
5	115	94	2,700	1,100	1,300	842	202	82	65	82	101	122
6	77	77	2,700	1,030	1,300	782	202	65	65	82	101	145
7	77	115	2,700	1,160	1,640	782	145	65	65	82	101	145
8	94	202	2,100	1,100	1,850	722	145	65	65	82	101	145
9	274	236	1,500	1,100	1,850	664	145	65	65	82	101	145
10	236	236	1,400	1,780	1,640	608	145	65	65	82	101	145
11	236	236	1,300	1,370	1,640	553	145	65	65	82	101	172
12	236	236	966	1,570	1,430	553	145	65	65	82	101	172
13	202	274	966	1,640	1,640	553	122	65	65	82	101	202
14	202	450	1,100	1,570	1,710	553	122	65	65	82	101	202
15	140	402	1,160	1,370	1,640	500	122	65	65	82	101	202
16	202	236	1,300	1,230	1,640	450	122	65	65	82	101	145
17	202	115	1,370	1,160	1,370	450	122	65	65	82	122	122
18	202	236	1,570	1,160	1,300	450	122	65	65	101	101	145
19	202	236	1,710	1,230	1,230	402	122	65	65	101	122	145
20	140	236	1,920	1,230	1,230	402	122	65	65	122	122	122
21	170	202	2,350	1,370	1,160	356	122	65	65	101	122	122
22	202	202	2,430	1,300	1,100	356	122	65	65	101	122	122
23	202	202	2,430	1,230	1,100	313	101	65	65	101	122	101
24	730	236	2,060	1,230	1,160	313	101	65	65	101	145	101
25	1,460	916	1,710	1,370	1,160	273	101	65	65	101	145	101
26	1,050	916	1,640	1,570	1,160	273	101	51	65	101	172	122
27	450	670	1,370	1,570	1,100	273	101	51	65	101	145	122
28	402	1,670	1,370	1,570	1,100	273	82	65	65	101	122	101
29	356	.....	1,160	1,640	1,030	236	82	65	65	101	145	101
30	402	.....	1,100	1,640	1,100	236	82	65	65	101	145	122
31	274	.....	904	.....	1,160	.....	82	65	.....	101	.....	122

NOTE.—Daily discharge Jan. 1 to Mar. 1 determined from a rating curve well defined between 90 and 235 second-feet. Discharge Mar. 2 to 11 estimated. Discharge after Mar. 11 determined from a rating curve well defined below 1,600 second-feet and derived from discharge measurements in 1910 and 1911.

Monthly discharge of Bruneau River near Hot Spring, Idaho, for 1910.

Month.	Discharge in second-feet			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	1,460	77	302	18,600	B.
February	1,670	77	346	19,200	B.
March	5,660	904	1,900	117,000	C.
April	1,780	904	1,320	78,600	A.
May	1,850	1,030	1,360	83,600	A.
June	1,160	236	547	32,500	A.
July	236	82	134	8,240	A.
August	82	51	66.8	4,110	A.
September	65	65	65.0	3,870	A.
October	122	65	90.2	5,550	A.
November	172	101	116	6,900	A.
December	202	101	134	8,240	A.
The year	5,660	51	534	386,000	

BRUNEAU RIVER NEAR GRANDVIEW, IDAHO.

This station, which is located in sec. 1, T. 6 S., R. 4 E., Boise meridian, about 1 mile from Comet post office, about one-fourth mile below the headworks of the Owyhee Land and Irrigation Co.'s canal system (where a station was maintained from 1895 to 1903), 10 miles east of Grandview, and about 8 miles west of Bruneau, Idaho, was established May 1, 1909, to determine the amount of water wasting into Snake River over the Bruneau dam.

The gage installed in 1895 was used until March 6, 1903, when a new staff gage was set at the same datum, 25 feet upstream on the left bank, at the ford on the old stage road about 1 mile above the mouth of the river. On May 1, 1909, readings on this gage were resumed and continued until November 6, 1909, when a new vertical staff gage was installed at the same datum about 46 feet upstream on the left bank. This gage was washed out March 2, 1910. On March 13, 1910, a new gage was installed at the same site, but at a datum 0.87 foot lower. The channel was changed considerably by this flood.

High-water measurements were formerly made from a boat and stay-line attachment. A cable and car were installed near the gage in September, 1910. Low-water measurements can be made by wading about 300 feet downstream from the gage.

As no record has been kept of the water diverted by the canal system, the discharge as measured at this station does not show the run-off from the drainage area above the station. The capacity of the canal system is probably not more than 250 second-feet.

The gage heights are probably not seriously affected by ice.

Discharge measurements of Bruneau River near Grandview, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 9	Hartwell and Purton	107	199	1.76	235
Mar. 14	O. W. Hartwell	118	383	4.33	1,110
July 23	Hartwell and Crandall	49	36.2	2.40	83
Aug. 19	O. W. Hartwell	30	11.5	2.00	15.1
Sept. 8	Lynn Crandall	47	27	2.25	53
21	do	53	49	2.43	89
Dec. 22	do	99	188	2.66	156
1911.					
Feb. 7	Lynn Crandall	113	251	3.20	409
Mar. 30	O. W. Hartwell	118	342	4.02	1,040
May 2	A. B. Purton	116	303	3.65	766
June 3	H. L. Stoner	118	323	3.85	873
July 1	do	112	247	3.28	469
Sept. 1	Lynn Crandall	38	18	2.02	19.1

NOTE.—Gage heights beginning Mar. 14, 1910, refer to new gage installed Mar. 13, 1910.

Daily gage height, in feet, of Bruneau River near Grandview, Idaho, for 1910.

[Chas. Drake, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	1.8	4.05	5.5	5.1	4.0	2.7	2.3	2.1	2.4	2.5	2.7
2	1.7	1.8	.....	5.5	4.2	4.0	2.6	2.3	2.1	2.4	2.5	2.7
3	1.65	1.7	.....	5.4	4.2	3.9	2.6	2.3	2.1	2.4	2.5	2.7
4	1.6	1.5	.....	5.4	4.2	3.9	2.6	2.3	2.2	2.4	2.5	2.8
5	1.6	1.5	.....	5.3	4.5	3.8	2.6	2.2	2.2	2.5	2.5	2.8
6	1.55	1.4	.....	5.3	4.6	3.8	2.6	2.2	2.2	2.5	2.5	2.7
7	1.5	1.4	.....	5.3	4.8	3.8	2.6	2.2	2.2	2.5	2.5	2.7
8	1.5	1.7	.....	5.2	5.0	3.7	2.6	2.1	2.2	2.5	2.5	2.7
9	1.55	1.8	.....	5.0	5.0	3.6	2.6	2.1	2.2	2.3	2.5	2.7
10	1.6	1.8	.....	4.9	5.2	3.5	2.6	2.1	2.2	2.4	2.5	2.8
11	1.65	1.8	.....	4.9	5.2	3.5	2.5	2.0	2.3	2.4	2.5	2.9
12	1.6	1.8	.....	4.9	5.4	3.2	2.5	2.0	2.3	2.4	2.5	3.2
13	1.6	1.8	4.3	5.3	4.8	3.4	2.5	2.0	2.3	2.4	2.6	2.9
14	1.5	2.1	4.3	5.5	4.8	3.3	2.9	2.0	2.3	2.4	2.6	2.9
15	1.6	2.1	4.5	5.0	4.6	3.3	2.9	2.0	2.3	2.4	2.6	2.8
16	1.6	2.0	4.6	5.0	4.4	3.2	2.9	2.0	2.4	2.4	2.6	2.8
17	1.7	1.8	4.6	4.8	4.4	3.2	2.9	2.0	2.5	2.6	2.6	2.7
18	1.7	1.7	4.7	4.4	4.4	3.2	2.6	2.0	2.5	2.6	2.6	2.7
19	1.8	1.8	4.8	4.5	4.3	3.2	2.5	2.0	2.5	2.6	2.6	2.7
20	1.8	1.8	5.0	4.5	4.3	3.2	2.5	2.0	2.5	2.5	2.6	2.7
21	2.0	1.8	5.2	4.5	4.3	3.2	2.4	2.0	2.5	2.5	2.6	2.7
22	2.0	1.7	5.8	4.5	4.3	3.1	2.4	2.0	2.5	2.5	2.7	2.7
23	2.0	1.8	5.6	4.3	4.3	3.1	2.4	2.0	2.5	2.5	2.7	2.6
24	2.0	1.8	5.6	4.2	4.3	3.0	2.4	2.0	2.4	2.5	2.7	2.6
25	2.7	3.05	5.6	4.2	4.3	3.0	2.4	2.1	2.4	2.5	2.8	2.6
26	2.7	2.95	5.5	4.4	4.3	2.9	2.4	2.1	2.4	2.5	2.8	2.6
27	2.7	2.5	5.5	4.5	4.2	2.9	2.4	2.1	2.4	2.5	2.8	2.6
28	2.7	3.2	5.4	5.0	4.2	2.8	2.3	2.1	2.4	2.5	2.7	2.6
29	2.0	.....	5.4	5.0	4.2	2.8	2.3	2.1	2.4	2.5	2.8	2.6
30	2.0	.....	5.4	5.0	4.1	2.7	2.3	2.1	2.4	2.5	2.7	2.6
31	2.0	.....	5.5	.....	4.0	.....	2.3	2.1	.....	2.5	.....	2.6

NOTE.—Gage heights to Mar. 1 refer to gage established Nov. 6, 1909; after that date to gage established Mar. 13, 1910.

Daily discharge, in second-feet, of Bruneau River near Grandview, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	214	255	1,680	2,240	1,960	1,040	167	62	30	82	106	167
2	214	255	5,700	2,240	1,160	1,040	134	62	30	82	106	167
3	196	214	2,900	2,150	1,160	950	134	62	30	82	106	167
4	177	144	2,900	2,150	1,170	950	134	62	44	82	106	205
5	177	144	2,800	2,050	1,440	866	134	44	44	106	106	205
6	160	114	2,800	2,060	1,530	866	134	44	44	106	106	167
7	144	114	2,800	2,070	1,720	866	134	44	44	106	106	167
8	144	214	2,200	1,970	1,900	783	134	30	44	106	106	167
9	160	255	1,600	1,800	1,900	701	134	30	44	62	106	167
10	177	255	1,500	1,710	2,090	622	134	30	44	82	106	205
11	196	255	1,400	1,710	2,090	622	106	16	62	82	106	248
12	177	255	1,300	1,720	2,280	412	106	16	62	82	106	412
13	177	255	1,080	2,000	1,730	547	106	16	62	82	134	248
14	144	402	1,080	2,270	1,730	477	248	16	62	82	134	248
15	177	402	1,260	1,810	1,550	477	248	16	62	82	134	205
16	177	350	1,360	1,820	1,380	412	248	16	82	82	134	205
17	214	255	1,360	1,640	1,380	412	248	16	106	134	134	167
18	214	214	1,450	1,280	1,380	412	134	16	106	134	134	167
19	255	255	1,540	1,370	1,300	412	106	16	106	134	134	167
20	255	255	1,720	1,380	1,300	412	106	16	106	106	134	167
21	350	255	1,920	1,380	1,300	412	82	16	106	106	134	167
22	350	214	2,470	1,390	1,300	352	82	16	106	106	167	167
23	350	255	2,290	1,220	1,300	352	82	16	106	106	167	134
24	350	255	2,300	1,130	1,300	297	82	16	82	106	167	134
25	760	990	2,310	1,130	1,300	297	82	30	82	106	205	134
26	760	923	2,210	1,320	1,300	248	82	30	82	106	205	134
27	760	634	2,220	1,410	1,210	248	82	30	82	106	205	134
28	760	1,090	2,130	1,860	1,210	205	62	30	82	106	167	134
29	350	.....	2,140	1,860	1,210	205	62	30	82	106	205	134
30	350	.....	2,150	1,870	1,120	167	62	30	82	106	167	134
31	350	.....	2,230	.....	1,040	.....	62	30	.....	106	.....	134

NOTE.—Discharge Jan. 1 to Mar. 1 determined from a rating curve well defined between 50 and 250 second feet and not well defined above. Discharge Mar. 2 to 12 estimated from some gage heights estimated by the observer. Discharge Mar. 13 to May 15 computed by indirect method for shifting channel. Discharge May 16 to Dec. 31 determined from a rating curve derived from measurements made during 1910 to 1912, and well defined below 1,500 second-feet.

Monthly discharge of Bruneau River near Grandview, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	760	144	298	18,300	B.
February	1,090	114	338	18,800	B.
March	5,700	1,080	2,090	129,000	C.
April	2,270	1,130	1,730	103,000	C.
May	2,280	1,040	1,480	91,000	B.
June	1,040	167	535	31,800	A.
July	248	62	124	7,620	A.
August	62	16	29.2	1,800	A.
September	106	30	70.2	4,180	A.
October	134	82	98.8	6,080	A.
November	205	106	138	8,210	A.
December	412	134	179	11,000	A.
The year	5,700	16	594	431,000	

EAST FORK OF BRUNEAU RIVER NEAR HOT SPRING, IDAHO.

This station, which is located on unsurveyed land at the Winter Camp ranch, 22 miles southeast of Hot Spring, was established August 13, 1910.

Records at this point indicate the total amount of water flowing into Bruneau River from the East Fork drainage area. They will also assist in computing water available for a series of proposed reservoirs on the tributaries of the East Fork near Threecreek post office.

The vertical staff gage is on the left bank about one-half mile below the ranch house. The datum of the gage has remained constant.

Discharge measurements are made by wading or from a gaging bridge near the gage. The channel may shift at high stages. Relation between gage height and discharge during winter months may be somewhat affected by ice.

Discharge measurements of East Fork of Bruneau River near Hot Spring, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 13	O. W. Hartwell	8	2.97	3.00	1.86
Sept. 12	Lynn Crandall	4	.95	2.82	.52
Dec. 12	do	23	21.8	3.79	15.6
12	do	23.5	23.4	3.78	14.8
13	do	23.5	21.7	3.74	13.8
1911.					
Feb. 6[a]	Lynn Crandall	15	8.7	4.3	22.0
Mar. 25	O. W. Hartwell	26	61.5	5.24	69.1
Apr. 30	A. B. Purton	29	65	5.45	79.6
June 4	H. L. Stoner	26	68.8	5.50	89.2
July 5	do	23.5	26.2	3.95	19.1
Sept. 2	Lynn Crandall	5.7	1.61	2.78	.82

[a] Ice present.

Daily gage height, in feet, and discharge, in second-feet, of East Fork of Bruneau River near Hot Spring, Idaho, for 1910.

[J. E. Wilkins, observer.]

Day.	August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.9	1.2	.....	2.9	3.3	5.5	3.4	7.0
2	.....	.....	2.9	1.2	3.1	2.9	3.4	7.0	3.4	7.0
3	.....	.....	3.0	1.9	3.2	4.1	3.4	7.0	3.5	8.8
4	.....	.....	3.0	1.9	3.2	4.1	3.4	7.0	3.5	8.8
5	.....	.....	3.0	1.9	3.2	4.1	3.4	7.0	3.5	8.8
6	.....	.....	3.0	1.9	3.2	4.1	3.4	7.0	3.5	8.8
7	.....	.....	2.9	1.2	3.2	4.1	3.4	7.0	3.5	8.8
8	.....	.....	3.0	1.9	3.3	5.5	3.4	7.0	3.5	8.8
9	.....	.....	2.9	1.2	3.3	5.5	3.4	7.0	3.6	11
10	.....	.....	2.9	1.2	3.3	5.5	3.5	8.8	3.7	13
11	.....	.....	2.9	1.2	3.3	5.5	3.5	8.8	3.8	15
12	.....	.....	2.9	1.2	3.3	5.5	3.5	8.8	3.8	15
13	3.0	1.9	2.8	.7	3.2	4.1	3.5	8.8	3.8	15
14	3.0	1.9	2.9	1.2	3.2	4.1	3.5	8.8	3.7	13
15	3.0	1.9	2.9	1.2	3.2	4.1	3.5	8.8	3.5	8.8
16	3.0	1.9	3.0	1.9	3.3	5.5	3.5	8.8	3.3	5.5
17	3.0	1.9	3.0	1.9	3.3	5.5	3.5	8.8	3.3	5.5
18	3.0	1.9	3.0	1.9	3.4	7.0	3.5	8.8	3.5	8.8
19	3.0	1.9	3.0	1.9	3.4	7.0	3.5	8.8	3.6	11
20	3.0	1.9	3.0	1.9	3.4	7.0	3.3	5.5	3.6	11
21	3.0	1.9	3.0	1.9	3.4	7.0	3.2	4.1	3.6	11
22	3.0	1.9	3.0	1.9	3.4	7.0	3.4	7.0	3.6	11
23	3.0	1.9	.....	1.9	3.4	7.0	3.4	7.0	3.5	8.8
24	2.9	1.2	.....	1.9	3.4	7.0	3.3	5.5	3.5	8.8
25	2.9	1.2	3.0	1.9	3.4	7.0	3.3	5.5	3.5	8.8
26	2.9	1.2	3.0	1.9	3.4	7.0	3.2	4.1	3.5	8.8
27	2.9	1.2	3.0	1.9	3.4	7.0	3.4	7.0	3.5	8.8
28	2.8	.7	3.0	1.9	3.4	7.0	3.5	8.8	3.5	8.8
29	2.8	.7	3.1	2.9	3.4	7.0	3.6	11	3.4	7.0
30	2.9	1.2	3.1	2.9	3.3	5.5	3.6	11	3.4	7.0
31	2.9	1.2	.....	.....	3.3	5.5	.....	.....	3.4	7.0

NOTE.—Daily discharge determined from a rating curve derived from discharge measurements made during 1910 and 1911 and well defined between 2 and 100 second-feet.

Monthly discharge of East Fork of Bruneau River near Hot Spring, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Aug. 13-31	1.9	0.7	1.55	58.4	B.
September	2.9	.7	1.72	102	B.
October	7.0	2.9	5.55	341	A.
November	11	4.1	7.53	448	A.
December	15	5.5	9.52	585	A.

SHEEP CREEK NEAR TINDALL, IDAHO.

This station, which is located on unsurveyed land at Roberson's, formerly Scott's ranch, about 12 miles south of Tindall, about 1 mile above Cowan's ranch, and 6 miles above the Eastman & Anderson ranch, was established December 18, 1910, to determine the water supply available for a proposed irrigation project.

Bull Creek enters about 6 miles above the station and Cat Creek about 2 miles below.

The vertical staff gage is fastened to the left bank about one-fourth mile above Roberson's house. Discharge measurements are made by wading, from a bridge at the gage or from a bridge at Cowan's ranch. The gage datum has remained constant since the station was established.

Discharge measurements of Sheep Creek near Tindall, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Dec. 18	Lynn Crandall	18	12	1.56	10.6
19	do	15	11	1.50	9.0
1911.					
Mar. 28	O. W. Hartwell	14	96.3	3.13	128
May 4	A. B. Purton	14	99.8	3.49	176
5	do	24	95.2	3.6	171
June 7	H. L. Stoner	22	.....	2.70	82.9
July 3	do	14	14.6	1.95	25.1
Sept. 6	Lynn Crandall	.....	.....	1.2	[a] 1

[a] Estimated.

NOTE.—Measurements of May 5 and June 7, made from a footbridge on Cowan's ranch about 1 mile below the gage. A ditch diverting above the footbridge on June 7 was measured and the result, 1.2 second-feet, is included in the discharge for the creek.

Daily gage height, in feet, and discharge, in second-feet, of Sheep Creek near Tindall, Idaho, for 1910.

[George Scott, observer.]

Day.	December.		Day.	December.		Day.	December.	
	Gage height.	Discharge.		Gage height.	Discharge.		Gage height.	Discharge
	Feet.	*Sec.ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
1	.....	.....	11	.....	.....	21	1.3	4.8
2	.....	.....	12	.....	.....	22	1.6	12
3	.....	.....	13	.....	.....	23	1.6	12
4	.....	.....	14	.....	.....	24	1.6	12
5	.....	.....	15	.....	.....	25	1.5	9.0
6	.....	.....	16	.....	.....	26	1.3	4.8
7	.....	.....	17	.....	.....	27	1.5	9.0
8	.....	.....	18	1.6	12	28	1.5	9.0
9	.....	.....	19	1.4	6.8	29	1.5	9.0
10	.....	.....	20	1.5	9.0	30	1.4	6.8
						31	1.5	9.0

NOTE.—Daily discharge determined from a rating curve based on discharge measurements in 1910 and 1911 and well defined for the 1910 gage heights.

Monthly discharge of Sheep Creek near Tindall, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
December 18–31	12	4.8	8.94	248	A.

MARYS CREEK AT TINDALL, IDAHO.

This station, which is located directly back of the post office at Tindall, in sec. 28, T. 13 S., R. 5 E., Boise meridian, was established September 16, 1910, to determine the water supply available for a proposed Carey Act project.

Rattlesnake Creek flows into Marys Creek about three fourths of a mile below the station. Two small ditches, having a combined capacity of about 9 second-feet, divert water for the Tindall ranch from a point about 1 mile above the gage and the seepage and waste from these ditches return to the stream about 1 mile below the station. During the low-water period the water rises and sinks in the bed at various points along the stream.

The vertical staff gage is on the left bank. Discharge measurements are made by wading or from a gaging bridge near the gage.

Discharge measurements of Marys Creek at Tindall, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 16	Lynn Crandall	.....	.....	2.1	[a] 0.4
Dec. 16[b]	.....do	17	19	2.46	9.59
1911.					
Mar. 27	O. W. Hartwell	29	51.4	3.44	84.0
May 4	A. B. Purton	27.5	45.0	3.16	64.4
6	.....do	27.5	48.9	3.32	80.7
June 7	H. L. Stoner	25	31.4	2.80	31.3
July 2[b]	.....do	11	4.70	2.30	5.06

[a] Discharge estimated. [b] Measurement made by wading.

Daily gage height, in feet, and discharge, in second-feet, of Marys Creek at Tindall, Idaho, for 1910.

[Edith Tindall, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.0	0.0	2.2	2.4	2.4	8.0
2			2.0	.0	2.2	2.4	2.4	8.0
3			2.0	.0	2.3	4.8	2.4	8.0
4			2.0	.0	2.3	4.8	2.4	8.0
5			2.0	.0	2.3	4.8	2.4	8.0
6			2.0	.0	2.3	4.8	2.5	12
7			2.0	.0	2.3	4.8	2.5	12
8			2.0	.0	2.3	4.8	2.6	17
9			2.0	.0	2.3	4.8	2.7	24
10			2.0	.0	2.3	4.8	2.8	31
11			2.0	.0	2.3	4.8	2.9	39
12			2.0	.0	2.3	4.8	2.9	39
13			2.0	.0	2.4	8.0	2.8	31
14			2.0	.0	2.4	8.0	2.7	24
15			2.0	.0	2.3	4.8	2.6	17
16	2.1	0.7	2.0	.0	2.3	4.8	2.5	12
17	2.2	2.4	2.0	.0	2.3	4.8	2.4	8.0
18	2.3	4.8	2.0	.0	2.3	4.8	2.4	8.0
19	2.3	4.8	2.0	.0	2.3	4.8	2.3	4.8
20	2.3	4.8	2.0	.0	2.3	4.8	2.3	4.8
21	2.3	4.8	2.0	.0	2.3	4.8	2.3	4.8
22	2.3	4.8	2.2	2.4	2.3	4.8	2.3	4.8
23	2.2	2.4	2.2	2.4	2.3	4.8	2.3	4.8
24	2.1	.7	2.3	4.8	2.3	4.8	2.3	4.8
25	2.1	.7	2.2	2.4	2.3	4.8	2.3	4.8
26	2.0	.0	2.2	2.4	2.3	4.8	2.2	2.4
27	2.0	.0	2.2	2.4	2.4	8.0	2.2	2.4
28	2.0	.0	2.2	2.4	2.4	8.0	2.2	2.4
29	2.0	.0	2.1	.7	2.4	8.0	2.2	2.4
30	2.0	.0	2.1	.7	2.4	8.0	2.1	.7
31			2.1	.7			2.1	.7

NOTE.—Water was standing in pools Sept. 26 to Oct. 21. Daily discharge determined from a rating curve based on measurements in 1910 and 1911, well defined between 24 and 130 second-feet and fairly well defined below 24 second-feet.

Monthly discharge of Marys Creek at Tindall, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
September 16–30	4.8	0.0	2.06	61.3	C.
October	4.8	.0	.69	42.4	C.
November	8.0	2.4	5.28	314	B.
December	39	.7	11.6	713	B.

CASTLE CREEK BASIN.

CASTLE CREEK NEAR CASTLE CREEK, IDAHO.

This station, which is located at the Toy ranch, in sec. 21, T. 5 S., R. 1 E., Boise meridian, 3 miles upstream from Castle Creek post office, was established September 22, 1910, to determine the water supply available for storage at a site a short distance above the station.

The measuring section is in a timber-lined rating flume previously installed by private parties. The staff gage is located in the flume.

A good rating curve has been developed from discharge measurements in 1910 and 1911. The relation between gage height and discharge is not affected by the presence of ice.

Discharge measurements of Castle Creek near Castle Creek, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 22	O. W. Hartwell	1.5	0.38	0.12	0.34
Nov. 15	Lynn Crandall	9	1.86	.17	1.52
1911.					
Feb. 4	Lynn Crandall	17.5	8.7	.38	15.4
5	do	18.5	11.3	.44	22.8
5	do	20	13.5	.52	31.5
Mar. 31	A. B. Purton	23.7	24.1	1.0	113

Daily gage height, in feet, and discharge, in second-feet, of Castle Creek near Castle Creek, Idaho, for 1910.

[Mrs. Toy, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			0.10	0.5	0.25	4.7	0.30	8.0
2			.10	.5	.25	4.7	.30	8.0
3			.10	.5	.25	4.7	.30	8.0
4			.10	.5	.25	4.7	.30	8.0
5			.10	.5	.18	1.9	.30	8.0
6			.10	.5	.18	1.9	.30	8.0
7			.10	.5	.18	1.9	.30	8.0
8			.10	.5	.18	1.9	.30	8.0
9			.10	.5	.18	1.9	.30	8.0
10			.10	.5	.18	1.9	.30	8.0
11			.10	.5	.18	1.9	.30	8.0
12			.15	1.1	.18	1.9	.35	12.8
13			.25	4.7	.18	1.9	.35	12.8
14			.25	4.7	.18	1.9	.35	12.8
15			.25	4.7	.18	1.9	.35	12.8
16			.25	4.7	.18	1.9	.35	12.8
17			.25	4.7	.18	1.9	.35	12.8
18			.25	4.7	.18	1.9	.35	12.8
19			.25	4.7	.18	1.9	.35	12.8
20			.25	4.7	.18	1.9	.30	8.0
21			.25	4.7	.18	1.9	.30	8.0
22	0.05	0.2	.25	4.7	.18	1.9	.30	8.0
23	.06	.3	.25	4.7	.20	2.5	.30	8.0
24	.06	.3	.25	4.7	.20	2.5	.30	8.0
25	.06	.3	.25	4.7	.20	2.5	.30	8.0
26	.08	.4	.25	4.7	.20	2.5	.30	8.0
27	.08	.4	.25	4.7	.25	4.7	.25	4.7
28	.10	.5	.25	4.7	.30	8.0	.25	4.7
29	.10	.5	.25	4.7	.30	8.0	.20	2.5
30	.10	.5	.25	4.7	.30	8.0	.20	2.5
31			.25	4.7			.20	2.5

NOTE.—Daily discharge determined from a rating curve derived from measurements in 1910 and 1911; curve well defined above 8 second-feet and fairly well between 2 and 8 second-feet.

Monthly discharge of Castle Creek near Castle Creek, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
September	0.5	0.2	0.38	7.0	D.
October	4.7	.5	3.09	190	B.
November	8.0	1.9	3.06	182	B.
December	12.8	2.5	8.49	522	A.

SUCCOR CREEK BASIN.

Succor Creek rises in the Mahogany Mountains, in the eastern part of Malheur County, Oreg., flows northeastward, and joins Snake River near Homedale, Idaho.

SUCCOR CREEK NEAR HOMEDALE, IDAHO.

This gaging station, which was originally located at a small truss bridge built to carry a flume, about half a mile above the mouth of the creek, was established March 19, 1903, and has been moved twice, the second time on August 28, 1907, when the cable was moved about one-fourth mile downstream. On January 24, 1908, a new chain gage was installed at a point about 200 feet above the cable. This gage was washed out January 20, 1909, but was replaced on January 23, 1909, by a new staff gage with the same datum. The station was discontinued February 24, 1910.

The station is below all tributaries and diversion canals. The entire low-water flow is diverted for irrigation above.

No discharge measurements were made during 1910.

Daily gage height, in feet, and discharge, in second-feet, of Succor Creek near Homedale, Idaho, for 1910.

[Mabel Fletcher, observer.]

Day.	January.		February.		Day.	January.		February.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1	1.2	.....	1.15	0.2	16	1.2	.....	1.2	1.8
2	1.2	.....	1.15	.2	17	1.2	.....	1.2	1.8
3	1.2	.....	1.15	.2	18	1.2	.....	1.2	1.8
4	1.2	.....	1.2	1.8	19	1.2	.....	2.2	1.8
5	1.2	.....	1.2	1.8	20	1.2	.....	1.2	1.8
6	1.2	.....	1.2	1.8	21	1.2	.....	1.2	1.8
7	1.2	.....	1.15	.2	22	1.2	.....	1.2	1.8
8	1.2	.....	1.15	.2	23	3.15	292	2.15	105
9	1.2	.....	1.15	.2	24	3.15	292	5.1	748
10	1.2	.....	1.2	1.8	25	2.15	1.05	.....	.....
11	1.2	.....	1.2	1.8	26	1.2	1.8	.....	.....
12	1.2	.....	1.2	1.8	27	1.2	1.8	.....	.....
13	1.2	.....	1.2	1.8	28	1.2	1.8	.....	.....
14	1.2	.....	3.0	261	29	1.2	1.8	.....	.....
15	1.2	.....	2.15	105	30	1.15	.2	.....	.....
					31	1.15	.2	.....	.....

NOTE.—Stream frozen Jan. 1 to 22. Daily discharges determined from a rating curve not well defined.

Monthly discharge of Succor Creek near Homedale, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	292	0.2	19.2	1,180
Feb. 1-24	748	.2	56.5	2,690

NOTE.—Mean discharge for Jan. 1 to 22 estimated at 0.2 second-foot. Monthly means only approximate.

OWYHEE RIVER BASIN.

GENERAL FEATURES.

Owyhee River rises in the Independence National Forest in the north-central portion of Nevada, flows north, then northwest across the corner of Idaho and into Oregon, where it turns abruptly and flows northeastward to its junction with Snake River, near Nyssa, Oreg., opposite the mouth of Boise River in Idaho. The total length of the river is about 220 miles, and the drainage area comprises 11,100 square miles.

The country drained is an arid desert, the annual precipitation ranging from 6 to 9 inches, the larger part occurring as snowfall. Forests are entirely lacking except on the extreme headwaters, and even there they are small. The general elevation of the river basin is about 4,000 feet, and the altitudes have but little effect on the precipitation. The streams are frequently frozen for considerable periods during the winter months, so that records for this part of the year are subject to inaccuracies. The low-water flow of this stream at the mouth is nearly all taken by a large canal for the irrigation of lands lying between Owyhee and Malheur rivers. On the upper stretches of the river conditions are favorable for impounding the flood and winter flows for irrigation during the summer months.

OWYHEE RIVER AT OWYHEE, OREG.

This station, which is located in sec. 2, T. 12 S., R. 46 E., Willamette meridian, at the county bridge, half a mile from Owyhee post office and 3 miles above the mouth of the stream, was established March 26, 1890, discontinued October 3, 1896, and reestablished August 27, 1903.

The Owyhee ditch diverts water 6 miles above the gaging station. A record of the flow in this canal was kept during the irrigating season of 1905 at a point 2 miles below the intake. The maximum diversion during this period was 210 second-feet, in June. There are five wasteways on this canal, the first two being above the gaging station. The natural flow of the river at this point must

therefore be obtained by adding the diversion in the canal to the flow obtained at the river gaging station, and subtracting from this sum the amount returning from the first two wasteways.

The entire low-water flow is diverted for irrigation and the flow measured at this point at such times is only seepage water.

During the winter months the gage heights are somewhat affected by ice, but the periods during which the stream is icebound are short, and even at such times approximate records can be obtained. The datum of the gage has not been changed since its installation in 1903.

The two measurements of 1910, though somewhat inconsistent, indicate that conditions in the channel are practically permanent.

Discharge measurements of Owyhee River at Owyhee, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 1[a]	O. W. Hartwell	155	63	2.38	67.5
Nov. 22	L. Crandall	100	262	2.68	255

[a] Measured by wading.

Daily gage height, in feet, of Owyhee River at Owyhee, Oreg., for 1910.

[Gilder Watson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.6	5.0	11.4	7.6	4.9	4.4	2.2	2.2	2.6	2.4	.....	2.85
2	3.6	4.9	12.9	7.4	4.9	4.4	2.2	2.2	2.6	2.4	.....	2.9
3	3.6	4.75	12.1	7.2	4.9	4.35	2.2	2.2	2.0	2.4	.....	2.9
4	3.6	4.7	11.7	6.9	4.85	4.3	2.2	2.2	2.0	2.4	.....	2.9
5	3.6	4.65	10.9	6.4	4.85	4.2	2.2	2.2	2.0	2.4	.....	2.9
6	3.6	4.6	10.4	5.9	4.85	4.2	2.2	2.2	2.0	2.4	.....	2.9
7	3.6	4.6	9.9	6.0	5.5	4.12	2.2	2.2	2.0	2.4	.....	2.95
8	3.6	4.6	9.6	6.0	6.4	4.1	2.2	2.2	2.0	2.4	.....	2.95
9	3.6	4.6	9.1	6.0	6.0	4.1	2.2	2.2	2.0	2.4	.....	2.95
10	3.6	4.6	8.6	6.0	5.5	4.0	2.2	2.2	2.0	2.4	.....	3.0
11	3.6	4.6	8.4	6.0	5.35	3.95	2.2	2.2	2.0	2.4	.....	3.0
12	3.6	4.6	8.0	6.0	5.3	3.85	2.2	2.2	2.0	2.4	.....	3.1
13	3.6	4.6	7.8	5.9	5.25	3.7	2.2	2.2	2.0	2.4	.....	5.6
14	3.6	4.6	7.6	5.8	5.2	3.65	2.2	2.2	2.0	2.4	.....	5.4
15	3.6	6.6	8.7	5.7	5.15	3.6	2.2	2.2	2.0	2.4	.....	5.0
16	3.6	6.05	8.6	5.6	5.1	3.5	2.2	2.2	2.75	2.4	.....	4.7
17	3.6	5.85	9.0	5.55	5.0	3.4	2.2	2.2	2.75	2.4	.....	4.5
18	3.6	5.65	9.0	5.5	4.95	3.25	2.2	2.2	2.75	2.4	.....	4.45
19	3.6	5.4	9.6	5.45	4.85	3.0	2.2	2.2	2.75	2.4	.....	4.45
20	3.6	5.3	10.0	5.35	4.8	2.85	2.2	2.2	2.4	2.4	.....	4.35
21	3.6	5.0	10.3	5.3	4.7	2.7	2.2	2.2	2.4	2.4	.....	4.3
22	3.6	4.8	9.7	5.25	4.65	2.65	2.2	2.2	2.4	2.4	2.7	4.2
23	3.6	4.6	8.6	5.25	4.6	2.5	2.2	2.2	2.4	2.4	2.7	4.15
24	3.6	4.8	8.5	5.2	4.6	2.4	2.2	2.2	2.4	.....	2.7	3.0
25	3.6	6.3	8.35	5.15	4.6	2.35	2.2	2.2	2.4	.....	2.7	3.0
26	3.6	5.95	8.35	5.15	4.6	2.3	2.2	2.2	2.4	.....	2.75	3.05
27	3.6	5.55	8.3	5.1	4.55	2.3	2.2	2.2	2.4	.....	2.8	3.05
28	6.1	7.4	8.25	5.0	4.5	2.3	2.2	2.2	2.4	.....	2.85	3.0
29	6.1	.....	8.1	4.95	4.5	2.25	2.2	2.2	2.4	.....	2.85	3.0
30	6.0	.....	8.0	4.9	4.5	2.2	2.2	2.2	2.4	.....	2.85	3.0
31	5.1	.....	7.9	.....	4.5	.....	2.2	2.6	.....	.....	.....	3.0

NOTE.—River frozen over Jan. 1 to Feb. 25. Gage chain was stolen Oct. 24 and replaced Nov. 22; no readings obtained in the meantime.

Daily discharge, in second-feet, of Owyhee River at Owyhee, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	410	1,270	18,700	7,700	2,100	1,480	50	50	160	95	.....	270
2	410	1,170	23,200	7,180	2,100	1,480	50	50	160	95	.....	295
3	410	1,040	20,800	6,660	2,100	1,420	50	50	25	95	.....	295
4	410	995	19,600	5,920	2,030	1,370	50	50	25	95	.....	295
5	410	952	17,200	4,780	2,030	1,270	50	50	25	95	.....	295
6	410	910	15,700	3,770	2,030	1,270	50	50	25	95	.....	295
7	410	910	14,200	3,960	3,030	1,190	50	50	25	95	.....	322
8	410	910	13,300	3,960	4,780	1,170	50	50	25	95	.....	322
9	410	910	11,900	3,960	3,960	1,170	50	50	25	95	.....	322
10	410	910	10,400	3,960	3,030	1,080	50	50	25	95	.....	350
11	410	910	9,890	3,960	2,780	1,040	50	50	25	95	.....	350
12	410	910	8,780	3,960	2,700	952	50	50	25	95	.....	410
13	410	910	8,240	3,770	2,620	830	50	50	25	95	.....	3,210
14	410	910	7,700	3,580	2,540	792	50	50	25	95	.....	2,860
15	410	2,610	10,700	3,390	2,460	755	50	50	25	95	.....	2,240
16	410	2,030	10,400	3,210	2,390	680	50	50	222	95	.....	1,830
17	410	1,840	11,600	3,120	2,240	610	50	50	222	95	.....	1,590
18	410	1,650	11,600	3,030	2,170	508	50	50	222	95	.....	1,540
19	410	1,430	13,300	2,940	2,030	350	50	50	222	95	.....	1,540
20	410	1,350	14,500	2,780	1,960	270	50	50	95	95	.....	1,420
21	410	1,120	15,400	2,700	1,830	200	50	50	95	95	.....	1,370
22	410	980	13,600	2,620	1,770	180	50	50	95	95	200	1,270
23	410	855	10,400	2,620	1,710	125	50	50	95	95	200	1,220
24	410	980	10,200	2,540	1,710	95	50	50	95	.....	200	350
25	410	4,570	9,750	2,460	1,710	82	50	50	95	.....	200	350
26	410	3,860	9,750	2,460	1,710	70	50	50	95	.....	222	380
27	410	3,120	9,610	2,390	1,650	70	50	50	95	.....	245	380
28	2,700	7,180	9,470	2,240	1,590	70	50	50	95	.....	270	350
29	2,700	.....	9,050	2,170	1,590	60	50	50	95	.....	270	350
30	2,540	.....	8,780	2,100	1,590	50	50	50	95	.....	270	350
31	1,370	.....	8,510	.....	1,590	.....	50	160	.....	.....	.....	350

NOTE.—Daily discharge determined from a discharge rating curve well defined between 500 and 15,000 second-feet and fairly well defined outside these limits.

Daily discharge Jan. 1 to Feb. 25 estimated because of presence of ice; subject to large errors.

Monthly discharge of Owyhee River at Owyhee, Oreg., for 1910.

[Drainage area, 11,100 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	2,700	410	657	0.059	0.07	40,400	C.
February	7,180	855	1,690	.152	.16	93,900	C.
March	23,200	7,700	12,500	1.13	1.30	769,000	B.
April	7,700	2,100	3,660	.330	.37	218,000	A.
May	4,780	1,590	2,240	.202	.23	138,000	A.
June	1,480	50	690	.062	.07	41,100	B.
July	50	50	50.0	.0045	.005	3,070	B.
August	160	50	53.5	.0048	.006	3,290	B.
September	222	25	85.9	.0077	.009	5,110	B.
October	.....	.....	[a] 100	.0090	.01	6,150	C.
November	.....	.....	[a] 180	.016	.02	10,700	C.
December	3,210	270	864	.078	.09	53,100	B.
The year	23,200	25	1,900	.171	2.34	1,380,000	

[a] Estimated.

BOISE RIVER BASIN.

Boise River rises in the western part of Blaine County and flows westward across Elmore, Ada, and Caldwell counties to its junction with Snake River. Its drainage area is mountainous and well wooded.

BOISE RIVER NEAR HIGHLAND, IDAHO.

This gaging station, which is located in sec. 32, T. 3 N., R. 4 E., Boise meridian, 3 miles southwest of the discontinued Highland post office, about 8 miles above the old Boise station, and 15 miles east of Boise, was established July 27, 1905, to replace the station at Boise.

The records show the total flood waters available from Boise River and are used in connection with the distribution of the low-water flow for irrigation below.

Moores Creek joins the river 2½ miles above the station. The tributaries below are unimportant. But little water is diverted above the station.

Measurements are made from a cable and car at all stages. The present gage, which was installed November 22, 1909, is on the left bank of the stream about 100 feet below the cable. Its datum has remained constant. Several gages were used from 1905 to 1909, located at different points in the vicinity of the station and with slightly different datums.

The gage heights are somewhat affected by ice during the winter months.

Discharge measurements of Boise River near Highland, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 23	Hartwell and Price	234	1,340	8.96	7,610
June 11	Price and Jordan	227	1,050	7.68	5,620
22	O. W. Hartwell	218	811	6.44	3,930
July 5	Price and Murray	209	660	5.68	2,800
20	Hartwell and Crandall	204	394	4.37	1,440
23	Price and Westward	190	369	4.25	1,340
Aug. 11	A. C. Price	181	286	3.57	957
18	Lynn Crandall	184	296	3.5	908
Sept. 19	O. W. Hartwell	188	321	3.90	1,080
Nov. 13	Lynn Crandall	206	443	4.52	1,590

Daily gage height, in feet, of Boise River near Highland, Idaho, for 1910.

[Isak Kunzi, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.8	3.7	6.1	9.4	10.0	9.9	5.8	3.85	3.35	3.65	3.6	4.2
2	6.5	8.6	7.6	9.4	9.6	10.0	5.65	3.8	3.4	3.65	3.6	4.2
3	10.0	9.0	8.4	9.8	9.0	9.4	5.55	3.75	3.4	3.7	3.6	4.25
4	10.0	9.5	8.4	9.5	9.0	8.5	5.5	3.7	3.4	4.25	3.6	5.1
5	9.6	10.6	8.7	9.5	8.7	8.4	5.6	3.7	3.35	4.2	3.55	4.65
6	9.6	10.6	8.5	9.5	8.4	8.5	5.3	3.7	3.4	3.9	3.5	4.4
7	10.1	10.7	8.3	9.6	8.5	8.1	5.2	3.65	3.35	3.85	3.65	4.3
8	10.9	11.0	8.4	9.8	8.9	7.9	5.1	3.65	3.35	3.8	3.7	4.25
9	11.0	11.2	8.4	10.4	9.5	7.4	5.1	3.6	3.3	3.75	4.0	4.4
10	11.2	10.5	8.4	10.8	10.6	7.3	5.0	3.6	3.3	3.75	4.0	4.3
11	10.0	9.2	8.5	11.4	10.5	7.7	4.95	3.55	3.2	3.7	4.1	4.3
12	9.4	9.0	8.7	11.7	10.4	7.9	4.85	3.5	3.2	3.7	4.7	4.4
13	9.0	9.0	8.9	11.6	10.4	7.6	4.8	3.5	3.2	3.7	4.55	4.0
14	8.5	8.6	9.5	11.2	10.3	7.5	4.75	3.5	3.3	3.7	4.1	3.7
15	8.3	8.0	9.7	10.8	10.0	7.5	4.7	3.5	3.65	3.7	4.0	3.7
16	8.3	8.0	10.0	10.5	9.6	7.4	4.65	3.5	3.9	3.7	3.9	3.75
17	8.0	8.0	10.4	10.5	9.3	7.3	4.3	3.5	4.3	3.75	3.9	4.0
18	7.8	7.8	10.7	10.5	9.3	7.2	4.5	3.5	4.1	3.95	4.0	3.9
19	7.8	8.0	11.6	10.6	9.3	6.7	4.5	3.45	4.1	3.8	4.0	3.9
20	7.7	8.2	13.7	11.0	9.0	6.6	4.35	3.4	3.9	3.75	3.95	3.85
21	7.7	8.0	14.0	10.8	8.8	6.6	4.35	3.35	3.8	3.75	4.25	3.9
22	8.0	8.0	14.6	10.7	8.7	6.45	4.35	3.4	3.7	3.7	4.55	4.0
23	8.3	7.3	14.3	10.8	9.0	6.2	4.25	3.35	3.6	3.7	4.8	4.0
24	9.0	7.0	11.8	10.8	9.9	6.1	4.2	3.35	3.6	3.7	4.7	4.2
25	9.6	6.3	11.0	11.1	9.8	6.1	4.15	3.35	3.65	3.65	4.6	3.9
26	9.2	4.9	10.6	11.3	9.2	6.1	4.1	3.35	3.65	3.65	4.3	3.7
27	9.5	5.0	10.0	11.4	9.3	6.1	4.0	3.4	3.65	3.65	3.9	3.7
28	9.5	5.1	9.9	11.3	9.0	6.1	4.0	3.35	3.65	3.6	4.1	3.8
29	8.9	.....	9.7	11.1	8.8	6.0	3.95	3.4	3.65	3.6	4.2	3.9
30	8.9	.....	9.5	10.6	9.1	5.9	3.9	3.35	3.65	3.6	4.2	3.9
31	8.9	.....	9.4	.....	9.4	.....	3.85	3.4	.....	3.6	.....	4.0

NOTE.—Ice present Jan. 1 to about Feb. 23; slush ice reported in stream Dec. 13.

Daily discharge, in second-feet, of Boise River near Highland, Idaho, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,360	8,290	9,250	9,090	2,970	1,070	830	965	940	1,300
2	5,500	8,290	8,610	9,250	2,780	1,040	850	965	940	1,300
3	6,700	8,930	7,650	8,290	2,660	1,020	850	990	940	1,340
4	6,700	8,450	7,650	6,850	2,600	990	850	1,340	940	2,140
5	7,170	8,450	7,170	6,700	2,720	990	830	1,300	915	1,680
6	6,850	8,450	6,700	6,850	2,360	990	850	1,100	890	1,460
7	6,550	8,610	6,850	6,250	2,250	965	830	1,070	965	1,380
8	6,700	8,930	7,190	5,950	2,140	965	830	1,040	990	1,340
9	6,700	9,890	8,450	5,200	2,140	940	810	1,020	1,160	1,460
10	6,700	10,500	10,200	5,050	2,030	940	810	1,020	1,160	1,380
11	6,850	11,500	10,000	5,650	1,980	915	780	990	1,230	1,380
12	7,170	12,000	9,890	5,950	1,880	890	780	990	1,730	1,460
13	7,490	11,800	9,890	5,500	1,830	890	780	990	1,600	1,160
14	8,450	11,200	9,730	5,350	1,780	890	810	990	1,230	990
15	8,770	10,500	9,250	5,350	1,730	890	965	990	1,160	990
16	9,250	10,000	8,610	5,200	1,680	890	1,100	990	1,100	1,020
17	9,890	10,000	8,130	5,050	1,380	890	1,380	1,020	1,100	1,160
18	10,400	10,000	8,130	4,900	1,550	890	1,230	1,130	1,160	1,100
19	11,800	10,200	8,130	4,190	1,550	870	1,230	1,040	1,160	1,100
20	15,200	10,800	7,650	4,050	1,420	850	1,100	1,020	1,130	1,070
21	15,600	10,500	7,330	4,050	1,420	830	1,040	1,020	1,340	1,100
22	16,600	10,400	7,170	3,840	1,420	850	990	990	1,600	1,160
23	16,100	10,500	7,650	3,490	1,340	830	940	990	1,830	1,160
24	12,100	10,500	9,090	3,360	1,300	830	940	990	1,730	1,300
25	10,800	11,000	8,930	3,360	1,260	830	965	965	1,640	1,100
26	10,200	11,300	7,970	3,360	1,230	830	965	965	1,380	990
27	9,250	11,500	8,130	3,360	1,160	850	965	965	1,100	990
28	9,090	11,300	7,650	3,360	1,160	830	965	940	1,230	1,040
29	8,770	11,000	7,330	3,230	1,130	850	965	940	1,300	1,100
30	8,450	10,200	7,810	3,100	1,100	830	965	940	1,300	1,100
31	8,290	.....	8,290	.....	1,070	850	.....	940	.....	1,160

NOTE.—Daily discharges computed from a rating curve well defined between 900 and 8,000 second-feet.

Monthly discharge of Boise River near Highland, Idaho, for 1910.

[Drainage area, 2,650 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	.....	.....	1,300	0.491	0.57	79,900	D.
February	.....	.....	1,200	.453	.47	66,600	D.
March	16,600	3,360	9,140	3.45	3.98	562,000	B.
April	12,000	8,290	10,200	3.85	4.30	607,000	B.
May	10,200	6,700	8,280	3.12	3.60	509,000	B.
June	9,250	3,100	5,170	1.95	2.18	308,000	A.
July	2,970	1,070	1,770	.668	.77	109,000	A.
August	1,070	830	903	.341	.39	55,500	A.
September	1,380	780	940	.355	.40	55,900	A.
October	1,340	940	1,020	.385	.44	62,700	A.
November	1,830	890	1,230	.464	.52	73,200	A.
December	2,140	990	1,240	.468	.54	76,200	B.
The year	16,600	780	3,540	1.33	18.16	2,560,000	

NOTE.—Mean discharges for January and February have been estimated because of ice conditions.

GRIMES CREEK NEAR CENTERVILLE, IDAHO.

Grimes Creek is the largest tributary of Moores Creek, which is tributary to Boise River just above the Highland gaging station.

The station on Grimes Creek, which is located about 4½ miles below Centerville, about one-half mile below Quartz Creek, its largest tributary, and 1,200 feet below the mouth of the canyon, was established by the United States Reclamation Service in December, 1909, and discontinued June 30, 1910.

The station is equipped with a staff gage and a car and cable. The bed of the stream is composed of sand, which constantly shifts, forming bars. This sediment is produced by placer mining along the creek above the station.

The station was maintained and the records published herewith were furnished by the United States Reclamation Service.

Discharge measurements of Grimes Creek near Centerville, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 22	Price and Hockberger	148	148	1.80	535
June 7	Price and Shank	145	65	1.50	171
25	H. L. Stoner	143	31	1.36	54.8
25[a]	do	31.5	24	1.30	68.5

[a] Measurement made one mile below regular section.

Daily gage height, in feet, of Grimes Creek near Centerville, Idaho, for 1909–10.

[S. E. Johnson, observer.]

Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.
1909.		1909.		1909.		1909.		1909.		1909.	
1		6		11		16		21		26	
2		7		12		17		22		27	
3		8		13		18		23		28	
4		9		14		19		24		29	1.8
5		10		15		20		25		30	
										31	

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1910.							1910.						
1							16		1.8				
2							17			3.6		1.75	
3			4.0		1.7		18						
4							19						
5	2.2						20	2.3			1.9		
6				1.7			21						1.25
7						1.55	22				1.8		
8							23			2.9			
9		2.8	2.9				24		2.9				
10							25					1.65	1.3
11					1.9		26				1.85		
12	2.3						27	1.8					
13				2.3			28						1.3
14						1.4	29						
15							30			2.1			
							31						

NOTE.—Ice was noted in the stream or along the banks up to the observation of Feb. 9, 1910.

MALHEUR RIVER BASIN.

GENERAL FEATURES.

Malheur River rises in the southwestern part of Grant County, flows southward to its junction with South Fork near Riverside, and thence eastward, receiving North Fork near Juntura, Bully Creek at Vale, and Willow Creek about 4 miles below Vale, and discharges into Snake River at Ontario. Its drainage basin, which includes the southeastern slope of the Blue Mountains and the eastern border of the divide that marks the boundary of the Great Basin in Oregon, is fan shaped, the outer border extending 140 miles along the mountain summits. The basin at the mouth of the river measures 4,150 square miles and at Riverside 1,910 square miles.

Elevations within the basin range from 5,000 feet at the headwaters to 2,000 at the mouth. The country is in general rough and broken, and is largely covered with sagebrush. Irrigation is restricted to the lower lands immediately adjoining the streams. The headwater areas are lightly forested, but elsewhere the area is timberless and is utilized as range for cattle and sheep.

The mean annual rainfall ranges from 16 inches on the headwaters to 10 inches at Vale. During the winter months the streams are icebound for part of the time.

This area offers some exceptional advantages for irrigation, for large storage sites and ample stream flow are conjoined with enormous areas of desert lands.

MIDDLE FORK OF MALHEUR RIVER ABOVE SOUTH FORK, AT RIVERSIDE, OREG.

This station, which is located about 200 feet above the mouth of South Fork of Malheur River, at Riverside, Oreg., was established January 3, 1906, to determine the amount of water available for storage in the Warm Springs reservoir site about 6 miles above. At present a large part of the summer flow is used for irrigation in small ditches that water the lands immediately contiguous to the stream.

A temporary vertical staff gage, located about 400 feet above the cable, was used until January 24, 1906, when it was replaced by a permanent sloping staff gage 15 feet below the cable. This was used until washed out on March 29, 1906. It was replaced, May 8, 1906, by a chain gage at the same location and datum. The gage readings during the interval were read from a temporary gage and reduced to the chain-gage datum. The station was discontinued March 31, 1907, on account of its inaccessibility and excessive cost. It was, however, reestablished December 15, 1908, and a new vertical staff gage installed about 200 feet above the cable on the left bank. An auxiliary chain gage was also installed at the cable in order to determine a relation between the gages at the two locations, but as the chain gage was destroyed on January 15, 1909, this relation was not determined. It is believed, however, that the form of the curve for both locations is practically the same. As the gage heights from the chain gage were affected by backwater from the South Fork this gage was not replaced.

The conditions at the staff gage above the cable are not favorable for refined results. The bed of the stream is of gravel and liable to change during freshets.

Ice interferes somewhat with winter records. Ice jams frequently form and cause backwater.

This station was discontinued May 25, 1910, and a station established on South Fork. The difference of the discharge below the forks and on South Fork gives the same record as this station.

Discharge measurements of Middle Fork of Malheur River above South Fork, at Riverside, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 1	L. R. Allen	116	201	4.14	811
May 25	do	.....	.....	2.45	[a] 115

[a] Discharge taken as difference of Middle Fork below the forks and South Fork.

Daily gage height, in feet, and discharge, in second-feet, of Middle Fork of Malheur River above South Fork, at Riverside, Oreg., for 1910.

[J. C. Blaylock, observer.]

Day.	January.		February.		March.		April.		May.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	2.3	38	3.1	140	9.8	4,770	4.2	840	3.7	350
2	2.3	38	3.0	120	10.7	5,490	4.2	840	3.7	350
3	2.4	51	3.0	120	.....	5,260	4.3	900	3.7	350
4	2.4	51	2.9	100	.....	5,040	4.2	840	3.8	350
5	2.4	51	2.3	78	.....	4,810	4.0	730	3.7	320
6	2.4	51	2.6	80	.....	4,590	4.2	840	3.6	320
7	2.4	51	2.8	80	.....	4,360	4.2	840	3.2	360
8	2.4	51	3.0	80	9.0	4,130	4.3	900	3.1	320
9	2.5	66	3.0	100	.....	4,290	4.3	900	3.1	320
10	2.7	102	3.0	100	.....	4,450	4.4	960	3.1	320
11	2.8	120	3.5	100	9.6	4,610	4.5	1,020	3.1	320
12	2.8	120	3.5	200	.....	4,290	4.4	960	3.2	360
13	2.8	120	3.4	300	.....	3,970	4.3	900	3.2	360
14	2.8	120	4.3	900	.....	3,660	4.2	840	3.0	285
15	3.1	180	3.5	465	.....	3,340	4.0	730	3.0	285
16	3.1	180	3.5	465	.....	3,020	4.0	730	2.9	250
17	3.0	169	3.4	420	.....	2,700	3.9	680	2.9	250
18	3.0	169	3.3	380	.....	2,380	3.8	630	2.8	215
19	2.8	120	3.4	420	.....	2,070	3.8	500	2.6	155
20	2.8	120	3.3	380	5.6	1,750	3.8	400	2.6	155
21	3.0	169	3.3	380	.....	1,640	3.7	380	2.6	155
22	3.0	169	3.4	420	.....	1,530	3.7	380	2.5	127
23	3.2	204	3.3	380	.....	1,410	3.8	420	2.5	127
24	3.4	300	3.4	420	.....	1,300	3.8	360	.....	114
25	3.4	280	5.4	850	.....	1,190	3.6	340	2.4	101
26	3.5	240	4.9	1,280	4.6	1,080	3.7	360	.....	111
27	3.4	200	5.0	1,340	4.5	1,020	3.7	400	.....	111
28	3.3	200	8.8	3,990	4.4	960	3.7	380	.....	111
29	3.4	170	.....	.....	4.3	900	3.7	360	.....	93
30	3.3	140	.....	.....	4.1	785	3.6	350	.....	84
31	3.4	140	.....	.....	3.9	680	.....	.....	.....	86

NOTE.—Upper section of the staff gage was taken out Feb. 28. Observer drove stakes at water's edge and recorded heights several times during following month. Temporary gage set by observer Mar. 26 was read until May 6, when readings were resumed on the lower section of the original gage.

River reported frozen 12 inches thick on Jan. 4. Probably frozen from about Jan. 1 to Feb. 13; ice jam Feb. 25, when ice went out of river.

Daily discharge determined from two fairly well defined discharge rating curves, the change having come in the high water of Mar. 2. Determinations of daily discharge Jan. 1 to 23 have been reduced 40 per cent to eliminate effect of ice. Discharge Jan. 24 to Feb. 13 estimated by comparison with records from observations at the station below the forks. Discharge Feb. 25 interpolated because of probable effect of ice jam. Discharge also interpolated for days in March for which gage heights are not recorded. The water was fluctuating considerably during this period and the interpolations give only approximate results. Discharge Apr. 19 to May 6 estimated from a hydrograph, as comparison with records for the station below the fork indicates that gage heights are of doubtful accuracy. Discharge given for May 26 to 31 is the difference between the values determined for the station below the forks and the South Fork.

Monthly discharge of Middle Fork of Malheur River above South Fork, at Riverside, Oreg., for 1910.

[Drainage area, 1,110 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	300	38	135	0.122	0.14	8,300	D.
February	3,990	78	503	.453	.47	27,900	C.
March	5,490	680	2,950	2.66	3.07	181,000	D.
April	1,020	340	657	.592	.66	39,100	C.
May	360	84	233	.210	.24	14,300	C.
June [a]	88	12	36.3	.033	.04	2,160	B.
July [a]	15	6	10.6	.0095	.01	652	C.
August [a]	14	.....	3.96	.0036	.004	243	C.
September [a]	42	8	27.8	.025	.03	1,650	B.
October [a]	45	32	40.8	.037	.04	2,510	B.
November [a]	112	45	60.6	.055	.06	3,610	B.
December [a]	239	31	102	.092	.11	6,270	B.
The year	5,490	.....	398	.359	4.87	288,000	

[a] Derived by subtracting the discharge of South Fork from the discharge of Middle Fork below the forks.

NOTE.—Monthly discharge June to December computed by subtracting discharge of South Fork from the total discharge below the forks. Maximum and minimum during the low-water months somewhat uncertain. The accuracy notes based on the accuracy rating of the other two stations.

MIDDLE FORK OF MALHEUR RIVER BELOW SOUTH FORK, AT RIVERSIDE, OREG.

This station, which is located at the county highway bridge about 1,000 feet below the mouth of the South Fork of Malheur River, at Riverside, Oreg., was established December 15, 1908, to determine the amount of water flowing through the canyon of Malheur River. Gage height observations were not begun until January 16, 1909, as it was at first not intended to maintain the station regularly.

The vertical staff gage is attached to the right abutment of the bridge from which discharge measurements are made.

Ice interferes somewhat with winter records, as at the station above the mouth of the South Fork.

Effort has been made to interpret the gage heights for 1909 and 1910 properly, but they are still subject to some uncertainty.

The channel is apparently permanent, and a well-defined discharge rating curve has been constructed for medium and low stages. Owing to the uncertainty of the upper part of the curve, estimates of discharge are withheld.

Discharge measurements of Middle Fork of Malheur River below South Fork, at Riverside, Oreg., in 1909–1911.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1909.					
Feb. 9	R. B. Post	108	243	1.97	168
Mar. 22	do	112	277	2.50	360
Nov. 21	do			1.47	[a] 88
1910.					
Apr. 1	L. R. Allen	116	481	3.40	897
May 25	do	110	261	1.67	126
Oct. 11[b]	R. W. Davenport	58	58	1.20	49
Nov. 11	F. F. Henshaw	112	266	1.36	77
1911.					
Mar. 17	R. W. Davenport	140	466	3.97	1,710

[a] Sum of Middle and South forks. [b] Measured by wading.

Daily gage height, in feet, of Middle Fork of Malheur River below South Fork, at Riverside, Oreg., for 1909–10.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1			2.4		2.7		1.5	1.9	1.5	2.0	2.0	1.9
2			2.8		2.6		1.4	2.0	1.6	2.1	1.8	1.8
3			2.8		2.6		1.5	1.9	1.5	1.9	1.8	1.7
4			3.2		2.5		1.4	1.8	1.8	2.0	1.6	1.7
5			3.0		2.5		1.5	1.6	1.7	1.9	1.6	1.7
6			2.9		2.6		1.4	1.5	1.8	2.0	1.5	1.8
7			2.8		2.6		1.5	1.4	1.7	1.9	1.6	1.7
8			3.2		2.4		1.4	1.5	1.8	2.0	1.6	1.8
9		2.0	2.7		2.5		1.5	1.4	1.7	1.9	1.7	1.7
10		2.1	2.5		2.5		1.4	1.5	2.0	1.9	1.7	1.7
11		2.3	2.6		2.4		1.4	1.4	1.7	1.8	1.6	1.6
12		2.3	2.5		2.4		1.3	1.5	1.8	1.8	1.8	1.9
13		2.8	2.5		2.4		1.5	1.4	1.7	1.7	1.7	1.8
14		3.7	2.8		2.4		1.2	1.5	1.8	1.8	1.8	1.9
15		2.8	2.7		2.5		1.2	1.4	1.7	1.7	1.7	1.8
16	4.8	2.8	2.7		2.5		1.1	1.5	2.0	1.8	1.8	1.8
17	3.1	4.9	2.8				1.2	1.4	1.6	1.6	1.7	1.6
18	2.9	4.0	2.8				1.1	1.5	1.7	1.7	1.5	1.7
19	3.0	3.4	2.8	3.1			1.1	1.4	1.7	1.6	1.5	1.6
20	3.4	3.0	2.7	3.1			1.0	1.5	1.8	1.7	1.4	1.6
21	3.0	2.4	2.5	2.9			1.1	1.4	1.7	1.7	1.5	1.5
22	2.6	2.4	2.5	2.8			1.0	1.5	1.8	1.8	2.0	1.6
23	2.2	2.6	2.4	2.8	2.4		1.1	1.4	1.7	1.7	2.2	1.5
24		2.6	2.6	2.8	2.4		1.0	1.5	1.9	1.9	2.6	1.7
25		2.7	2.8	2.8	2.4		2.0	1.4	1.8	1.8	2.4	1.6
26		2.5	2.8	2.8	2.4		1.9	1.5	1.9	1.9	2.4	1.7
27		2.5	2.8	2.7	2.4	1.5	2.0	1.4	1.8	1.8	2.3	1.7
28		2.7	3.1	2.8	2.4	1.4	1.9	1.5	1.9	1.9	2.3	1.6
29			3.3	2.8	2.4	1.5	2.0	1.4	1.9	1.8	2.2	1.5
30			3.2	2.7	2.4	1.4	1.9	1.5	2.1	2.0	2.1	1.6
31			2.9				2.0	1.6		1.9		1.5
1910.												
1	1.7	1.8	9.45	3.4	2.6	1.5	0.75	0.7	0.8	1.15	1.25	1.9
2	1.6	1.6	8.3	3.5	2.6	1.4	.8	.65	.8	1.15	1.25	1.85
3	1.7	1.7	6.75	3.3	2.6	1.4	.75	.6	.9	1.2	1.25	1.7
4	1.6	1.5	5.7	3.4	2.7	1.4	.75	.6	.9	1.2	1.25	2.8
5	1.7	1.6	6.0	3.5	2.6	1.35	.75	.55	.9	1.2	1.25	2.5
6	1.7	1.5	5.4	3.4	2.5	1.35	.7	.5	.9	1.1	1.25	2.0
7	1.8	1.5	5.0	3.6	2.5	1.25	.75	.45	.9	1.1	1.25	1.9
8	1.7	1.3	4.8	3.6	2.5	1.2	.75	.4	.9	1.1	1.3	1.75
9	1.8	1.5	4.95	3.6	2.5	1.2	.7	.35	.95	1.2	1.3	1.95
10	1.9	1.4	4.8	3.7	2.5	1.15	.7	.4	1.0	1.2	1.3	2.3
11	2.0	1.7	5.2	3.8	2.5	1.2	.75	.5	1.0	1.2	1.35	2.0
12	1.9	2.4	5.1	3.7	2.6	1.15	.75	.6	1.0	1.2	1.35	2.0
13	2.2	2.5	4.8	3.6	2.6	1.1	.75	.55	1.0	1.2	1.35	2.0
14	2.2	5.8	5.0	3.5	2.4	1.0	.75	.5	1.0	1.2	1.4	2.3
15	2.3	2.8	5.0	3.3	2.3	1.0	.75	.5	1.0	1.2	1.4	1.6

Daily gage height, in feet, of Middle Fork of Malheur River below South Fork, at Riverside, Oreg., for 1909–10—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
16	2.3	.....	5.0	3.3	2.2	1.0	.7	.5	1.2	1.2	1.4	1.6
17	2.3	.....	4.8	3.2	2.3	.95	.7	.55	1.1	1.2	1.45	1.6
18	2.3	.....	4.8	3.1	2.2	.95	.7	.55	1.1	1.25	1.45	1.4
19	2.0	.....	4.9	2.9	2.1	.9	.8	.55	1.15	1.25	1.45	1.3
20	1.9	.....	5.2	2.8	2.0	.9	.75	.6	1.15	1.25	1.45	1.2
21	2.1	.....	6.8	2.7	2.1	.9	.75	.6	1.2	1.25	1.4	1.3
22	2.0	.....	5.4	2.7	1.9	.95	.8	.6	1.2	1.25	1.35	1.6
23	2.5	5.4	5.6	2.9	1.9	.9	.75	.65	1.15	1.2	1.5	1.65
24	4.4	5.8	5.5	2.5	.....	.9	.75	.65	1.15	1.2	1.5	1.6
25	2.4	4.2	4.1	2.6	1.7	.85	.75	.7	1.1	1.2	1.55	1.65
26	2.4	4.9	4.9	2.6	1.65	.9	.75	.75	1.1	1.2	1.45	1.55
27	2.3	4.2	4.2	2.7	1.65	.85	.7	.75	1.1	1.25	1.45	1.55
28	3.3	8.1	3.7	2.8	1.65	.8	.7	.75	1.1	1.25	1.65	1.55
29	2.3	.....	3.7	2.7	1.55	.8	.7	.7	1.1	1.25	1.7	1.45
30	2.0	.....	3.3	2.6	1.5	.75	.7	.7	1.1	1.25	1.9	1.5
31	1.9	.....	2.8	.....	1.5	.....	.7	.8	.....	1.25	.....	1.5

NOTE.—Gage heights for 1909 are somewhat uncertain, as several gages, referred to slightly different datums, were used, and it is not always certain just which gage the observer used. They have been corrected to uniform datum as closely as possible. Readings Jan. 17 to 23 and May 15 to 30, are believed to be erroneous.

River probably frozen during a portion of January and February, 1909 and 1910; effect somewhat uncertain.

MALHEUR RIVER AT VALE, OREG.

This station was originally established March 20, 1890. Observations were suspended June 30, 1891, resumed January 1, 1895, suspended again September 30, 1896, and again resumed May 20, 1903. They were interrupted from April 1, 1907, to May 29, 1908. The station at present is located within the city limits of Vale, one-fourth mile below the mouth of Bully Creek and 2½ miles above the mouth of Willow Creek. The datum of the chain gage has not been changed since May 20, 1903.

Discharge measurements of Malheur River at Vale, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 18[a]	F. C. Ebert	22	18.9	3.39	26.8
Sept. 30[a]	O. W. Hartwell	70	38.1	3.43	30.7
Nov. 7[b]	F. F. Henshaw	133	174	3.75	102

[a] Measured by wading. [b] Measured from suspension foot-bridge 30 feet above cable.

Daily gage height, in feet, of Malheur River at Vale, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Sept.	Oct.	Nov.
1	4.1	4.7	10.1	5.9	5.1	3.25	3.35	.....	.....	3.5	3.7
2	4.1	4.7	17.5	5.95	5.05	3.25	.....	.....	.....	3.55	3.7
3	4.4	4.65	13.55	6.0	5.05	3.15	.....	3.25	.....	3.55	3.7
4	4.4	4.5	10.3	6.0	4.95	3.15	.....	.....	.....	3.55	3.7
5	4.4	4.35	8.3	5.75	4.85	3.25	.....	.....	.....	3.6	3.7
6	4.4	4.35	8.0	5.8	4.85	3.35	.....	.....	.....	3.6	3.7
7	4.4	4.35	7.9	5.8	4.9	3.35	.....	.....	.....	3.6	3.75
8	4.4	4.35	7.75	5.8	4.85	3.35	.....	.....	.....	3.65	3.75
9	4.4	4.4	7.1	5.9	4.8	3.35	.....	.....	.....	3.65	3.8
10	4.4	4.4	6.85	5.9	4.75	3.35	.....	.....	.....	3.65	3.85

Daily gage height, in feet, of Malheur River at Vale, Oreg.—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	.....	4.4	4.4	6.85	5.9	4.35	3.35	3.35	.....	3.35	3.65	3.85
12	.....	4.5	4.4	6.85	6.0	4.35	3.3	.....	.....	.....	3.65	3.9
13	.....	4.55	4.45	7.00	5.85	4.3	3.3	.....	.....	.....	3.65	3.85
14	.....	4.55	4.45	7.15	5.85	4.2	3.3	.....	.....	.....	3.65	3.85
15	.....	4.55	4.5	7.25	5.75	4.15	3.35	.....	.....	.....	3.65	3.85
16	.....	4.4	6.2	7.15	5.6	4.15	3.35	.....	.....	.....	3.65	3.9
17	.....	4.35	5.1	7.05	5.5	4.1	3.35	.....	.....	.....	3.65	3.9
18	.....	4.3	4.1	7.00	5.5	4.1	3.35	.....	.....	3.4	3.65	3.9
19	.....	4.3	3.3	7.1	5.5	4.0	3.35	.....	.....	3.4	3.65	3.9
20	.....	4.3	4.0	7.4	5.5	3.95	3.35	.....	.....	3.4	3.65	.....
21	.....	4.3	4.2	8.3	5.5	3.9	3.35	.....	3.3	3.4	3.6	.....
22	.....	4.3	4.6	8.8	5.5	3.85	3.4	.....	.....	3.4	3.6	.....
23	.....	4.3	4.9	8.5	5.45	3.65	3.4	.....	.....	3.4	3.6	.....
24	.....	4.25	5.0	8.6	5.45	3.65	3.4	.....	.....	3.4	3.6	.....
25	.....	4.25	5.8	9.1	5.4	3.6	3.4	.....	.....	3.4	3.6	.....
26	.....	4.25	7.0	7.15	5.35	3.55	3.35	.....	.....	3.4	3.6	.....
27	.....	4.4	9.15	6.75	5.2	3.5	3.35	.....	.....	3.4	3.6	.....
28	.....	4.4	12.05	6.35	5.2	3.5	3.35	.....	.....	3.35	3.6	.....
29	.....	4.45	.....	6.1	5.2	3.35	3.35	.....	.....	3.45	3.65	.....
30	.....	4.7	.....	6.05	5.2	3.4	3.35	3.25	.....	3.5	3.65	.....
31	.....	4.7	.....	5.9	.....	3.35	.....	.....	.....	.....	3.7	.....

NOTE.—River reported frozen Jan. 3 to about Jan. 30, but relation between gage height and discharge probably not much affected by ice after Jan. 23. Only occasional gage readings from July 1 to Sept. 18 and none after Nov. 19.

Daily discharge, in second-feet, of Malheur River at Vale, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	205	520	6,650	1,420	780	14	24	.....	.....	45	89	228
2	205	520	19,000	1,460	745	14	.....	.....	.....	56	89	271
3	250	490	12,000	1,510	745	7	.....	14	.....	56	89	271
4	250	400	6,950	1,510	675	7	.....	.....	.....	56	89	260
5	250	325	4,170	1,290	610	14	.....	.....	.....	66	89	228
6	250	325	3,780	1,330	610	24	.....	.....	.....	66	89	641
7	250	325	3,650	1,330	640	24	.....	.....	.....	66	101	487
8	250	325	3,460	1,330	610	24	.....	.....	.....	78	101	294
9	250	350	2,670	1,420	580	24	.....	.....	.....	78	113	256
10	250	350	2,380	1,420	550	24	.....	.....	.....	78	126	224
11	250	350	2,380	1,420	325	24	24	.....	24	78	126	283
12	250	350	2,380	1,510	325	18	.....	.....	.....	78	140	395
13	250	375	2,550	1,380	300	18	.....	.....	.....	78	126	294
14	250	375	2,730	1,380	250	18	.....	.....	.....	78	126	294
15	250	400	2,850	1,290	228	24	.....	.....	.....	78	126	279
16	250	1,700	2,730	1,170	228	24	.....	.....	.....	78	140	379
17	250	780	2,610	1,090	205	24	.....	.....	.....	78	140	209
18	250	205	2,550	1,090	205	24	.....	.....	29	78	140	209
19	250	40	2,670	1,090	170	24	.....	.....	29	78	140	209
20	250	170	3,030	1,090	155	24	.....	.....	29	78	174	176
21	250	250	4,170	1,090	140	24	.....	18	29	66	167	147
22	250	460	4,820	1,090	126	29	.....	.....	29	66	146	150
23	250	640	4,430	1,050	78	29	.....	.....	29	66	151	147
24	275	710	4,560	1,050	78	29	.....	.....	29	66	144	181
25	275	1,330	5,220	1,010	66	29	.....	.....	29	66	182	180
26	275	2,550	2,730	970	56	24	.....	.....	29	66	182	160
27	350	5,290	2,280	850	45	24	.....	.....	29	66	207	157
28	350	9,580	1,850	850	45	24	.....	.....	24	66	174	132
29	375	.....	1,600	850	24	24	.....	.....	37	78	135	129
30	520	.....	1,560	850	29	24	14	.....	45	78	194	127
31	520	.....	1,420	.....	24	.....	.....	.....	.....	89	.....	118

NOTE.—Daily discharge determined from a discharge rating curve well defined by measurements in 1910 between 25 to 150 second-feet, and fairly well by earlier measurements between 150 to 8,000 second-feet; above discharge 170 second-feet the curve coincides with that used for 1909. Discharge Jan. 3 to 23 estimated because of ice in river. Discharge Nov. 20 to 30 estimated as the sum of the discharge of Middle Fork below South Fork at Riverside and North Fork at Beulah, plus 10 second-feet. Discharge for December is the sum of discharge at these two stations plus an allowance of 20 second-feet for inflow below.

Monthly discharge of Malheur River at Vale, Oreg., for 1910.

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	520	205	277	0.066	0.08	17,000	C.
February	9,580	40	1,050	.251	.26	58,300	B.
March	19,000	1,420	4,380	1.05	1.21	269,000	A.
April	1,510	850	1,210	.289	.32	72,000	A.
May	780	24	311	.074	.09	19,100	B.
June	29	7	21.9	.0052	.006	1,300	C.
July	.....	14	[a] 20.6	.0049	.006	1,270	C.
August	.....	14	[a] 17.0	.0041	.005	1,050	C.
September	45	.....	[a] 26.6	.0063	.007	1,580	B.
October	89	45	70.9	.017	.02	4,360	B.
November	207	89	134	.032	.04	7,970	C.
December	641	118	242	.058	.07	14,900	C.
The year	19,000	14	647	.154	2.11	468,000	

[a] Estimated.

SOUTH FORK OF MALHEUR RIVER AT RIVERSIDE, OREG.

This station, which is located about 1,000 feet above the mouth of South Fork at Riverside, was established May 25, 1910. The records show the total run-off of the largely barren area drained by this stream and, by subtraction from Middle Fork below, the discharge available for storage in the Warm Springs reservoir.

Measurements are made from a cable near the vertical staff gage, which is securely bolted to rocks.

The conditions are fairly good for obtaining accurate results.

Discharge measurements of South Fork of Malheur River at Riverside, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 25[a]	L. R. Allen	28	14	1.60	11.2
Oct. 10[a]	R. W. Davenport	18	9.5	1.62	9.8
Nov. 11[a]	F. F. Henshaw	23	15.6	1.72	15.6

[a] Made by wading below cable.

Daily gage height, in feet, of South Fork of Malheur River at Riverside, Oreg., for 1910.

[J. C. Blaylock, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.5	1.3	1.5	1.6	1.6	1.65	2.0
2	.....	1.5	1.3	1.45	1.6	1.65	1.65	1.95
3	.....	1.5	1.3	1.5	1.6	1.65	1.65	1.8
4	.....	1.55	1.3	1.5	1.6	1.65	1.65	3.3
5	.....	1.55	1.3	1.5	1.55	1.6	1.65	2.55
6	.....	1.6	1.3	1.45	1.5	1.6	1.65	2.3
7	.....	1.6	1.3	1.45	1.5	1.6	1.65	2.0
8	.....	1.55	1.3	1.55	1.5	1.6	1.7	1.75
9	.....	1.4	1.3	1.4	1.5	1.6	1.7	2.3
10	.....	1.3	1.3	1.4	1.45	1.6	1.7	2.3
11	.....	1.3	1.3	1.4	1.45	1.6	1.7	2.3
12	.....	1.45	1.3	1.45	1.45	1.6	1.7	2.4
13	.....	1.5	1.3	1.4	1.5	1.65	1.7	2.4
14	.....	1.5	1.3	1.4	1.5	1.65	1.75	2.4
15	.....	1.5	1.3	1.4	1.5	1.65	1.75	2.4
16	.....	1.5	1.3	1.4	1.6	1.65	1.75	1.9
17	.....	1.45	1.35	1.4	1.6	1.65	1.75	1.6
18	.....	1.4	1.35	1.4	1.6	1.65	1.75	1.7
19	.....	1.45	1.35	1.4	1.6	1.65	1.75	1.8
20	.....	1.45	1.4	1.4	1.6	1.65	1.75	1.8
21	.....	1.45	1.4	1.4	1.65	1.65	1.75	1.8
22	.....	1.5	1.4	1.4	1.6	1.65	1.75	1.7
23	.....	1.4	1.4	1.45	1.6	1.6	1.8	1.75
24	.....	1.4	1.4	1.45	1.6	1.6	1.8	2.0
25	1.6	1.4	1.4	1.45	1.6	1.6	1.85	2.0
26	1.6	1.3	1.4	1.5	1.6	1.65	1.9	1.9
27	1.6	1.3	1.4	1.5	1.6	1.65	1.9	1.9
28	1.6	1.3	1.45	1.45	1.6	1.65	2.0	1.75
29	1.6	1.3	1.45	1.4	1.6	1.65	2.0	1.9
30	1.6	1.35	1.5	1.4	1.6	1.65	2.2	1.9
31	1.55	.....	1.5	1.4	.....	1.65	.....	1.9

NOTE.—Daily discharge determined from a discharge-rating curve well defined between 8 and 800 second-feet. Relation between gage heights and discharge not affected by ice during the period covered by the records.

Daily discharge, in second-feet, of South Fork of Malheur River at Riverside, Oreg., for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5	2	5	9	9	12	37
2	.....	5	2	4	9	12	12	32
3	.....	5	2	5	9	12	12	20
4	.....	7	2	5	9	12	12	342
5	.....	7	2	5	7	9	12	116
6	.....	9	2	4	5	9	12	74
7	.....	9	2	4	5	9	12	37
8	.....	7	2	7	5	9	14	17
9	.....	3	2	3	5	9	14	74
10	.....	2	2	3	4	9	14	74
11	.....	2	2	3	4	9	14	74
12	.....	4	2	4	4	9	14	89
13	.....	5	2	3	5	12	14	89
14	.....	5	2	3	5	12	17	89
15	.....	5	2	3	5	12	17	89
16	.....	5	2	3	9	12	17	28
17	.....	4	2.5	3	9	12	17	9
18	.....	3	2.5	3	9	12	17	14
19	.....	4	2.5	3	9	12	17	20
20	.....	4	3	3	9	12	17	20
21	.....	4	3	3	12	12	17	20
22	.....	5	3	3	9	12	17	14
23	.....	3	3	4	9	9	20	17
24	.....	3	3	4	9	9	20	37
25	9	3	3	4	9	9	24	37
26	9	2	3	5	9	12	28	28
27	9	2	3	5	9	12	28	28
28	9	2	4	4	9	12	37	17
29	9	2	4	3	9	12	37	28
30	9	2.5	5	3	9	12	60	28
31	7	.....	5	3	.....	12	.....	28

Monthly discharge of South Fork of Malheur River at Riverside, Oreg., for 1910.

[Drainage area, 800 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
May 25–31	9	7	8.71	0.011	0.003	121	B.
June	9	2	4.28	.0054	.006	255	C.
July	5	2	2.63	.0033	.004	162	C.
August	7	3	3.77	.0047	.005	232	C.
September	12	4	7.60	.0095	.01	452	C.
October	12	9	10.8	.014	.02	664	B.
November	60	12	19.2	.024	.03	1,140	B.
December	342	9	52.5	.066	.08	3,230	B.
The period						6,260	

NORTH FORK OF MALHEUR RIVER NEAR BEULAH, OREG.

This station, which is located 7 miles below Beulah, Oreg., in sec. 33, T. 20 S., R. 37 E. Willamette meridian, was established March 21, 1909.

The records represent practically the total run-off of North Fork and are of especial value as showing the quantity for storage in the Beulah or Agency Valley reservoir site just above.

Measurements are made from a standard cable. The right bank is low but is not liable to overflow. The left bank is high and rocky. The bed of the stream is composed of gravel and will change in ordinary freshets.

The original chain gage was so located that it was inaccessible at high stages, as was also the cable. On May 26, 1910, a new staff gage was installed about 300 feet below the old gage, where conditions are better, and in October the cable was moved to a lower point.

Records are good except at high water, where they are only approximate.

Discharge measurements of North Fork of Malheur River near Beulah, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 2	L. R. Allen	75	127	3.56	544
May 26	do	45	54.8	[a]2.28	128
Oct. 11[b]	R. W. Davenport	35	28.2	1.80	50.2
Nov. 10	F. F. Henshaw	47	62	1.90	66

[a] On new gage. Old gage read 2.52 feet.

[b] Made by wading above gage.

Daily gage height, in feet, of North Fork of Malheur River near Beulah, Oreg., for 1910.

[J. B. Robinson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.25	2.15	4.8	3.55	3.3	2.1	1.75	1.6	1.6	.....	1.8	2.0
2	2.3	2.1	5.1	3.6	3.25	2.1	1.75	1.6	1.65	.....	1.8	2.0
3	2.35	1.95	4.8	3.55	3.15	2.05	1.75	1.6	1.7	.....	1.9	2.0
4	2.2	2.1	4.2	3.5	3.1	2.0	1.75	1.6	.....	.....	1.95	2.3
5	2.2	2.25	4.2	3.6	3.1	2.0	1.75	1.6	.....	.....	1.75	2.2
6	2.3	2.3	3.6	3.6	3.05	2.0	1.75	1.6	.....	.....	1.7	2.0
7	2.25	2.4	3.5	3.45	3.0	2.0	1.7	1.6	.....	.....	1.9	1.9
8	2.25	2.5	3.6	3.55	2.95	2.0	1.7	1.6	.....	.....	2.0	1.9
9	2.4	2.5	3.6	3.6	2.95	2.0	1.7	1.6	.....	.....	2.1	2.0
10	2.5	2.45	3.5	3.65	2.95	1.95	1.7	1.65	.....	.....	1.9	2.1
11	2.55	2.55	3.6	3.7	2.9	1.95	1.7	1.65	.....	1.8	1.9	2.0
12	2.55	2.55	3.8	3.7	2.85	1.95	1.7	1.65	.....	.....	1.9	2.0
13	2.6	2.55	3.9	3.65	2.7	1.9	1.65	1.65	.....	.....	1.9	1.9
14	2.7	2.55	4.0	3.55	2.7	1.9	1.65	1.65	.....	.....	1.9	2.0
15	2.7	2.5	4.25	3.55	2.7	1.9	1.65	1.65	.....	.....	1.9	2.0
16	2.6	2.45	4.2	3.55	2.6	1.85	1.6	1.7	.....	.....	1.9	2.0
17	2.3	2.45	4.2	3.45	2.65	1.85	1.6	1.7	.....	.....	1.95	2.0
18	2.5	2.5	4.3	3.4	2.6	1.85	1.6	1.7	.....	.....	2.0	2.0
19	2.6	2.55	4.5	3.4	2.6	1.8	1.6	1.7	.....	.....	1.95	1.9
20	2.6	2.5	8.0	3.35	2.6	1.8	1.6	1.7	.....	.....	1.8	2.0
21	2.5	2.5	6.4	3.35	2.6	1.8	1.6	1.6	.....	.....	1.9	1.9
22	2.6	2.5	6.0	3.4	2.55	1.8	1.6	1.6	.....	.....	1.9	1.8
23	2.5	2.45	4.85	3.35	2.5	1.75	1.6	1.6	.....	.....	2.0	1.7
24	2.5	2.4	4.5	3.4	2.5	1.75	1.6	1.6	.....	.....	2.0	1.6
25	2.5	2.65	4.2	3.4	2.5	1.75	1.6	1.6	.....	.....	2.1	1.4
26	2.4	3.0	3.9	3.4	2.3	1.75	1.6	1.6	.....	.....	2.0	1.2
27	2.2	3.2	3.8	3.35	2.3	1.75	1.6	1.6	.....	.....	1.7	1.1
28	2.3	3.8	3.7	3.35	2.25	1.75	1.6	1.6	.....	.....	1.9	1.0
29	2.1	.....	3.7	3.4	2.25	1.75	1.6	1.6	.....	.....	2.0	1.3
30	2.1	.....	3.6	3.4	2.2	1.75	1.6	1.6	.....	.....	2.0	1.4
31	2.2	.....	3.5	.....	2.2	.....	1.6	1.6	.....	.....	.....	1.8

NOTE.—River reported frozen about half way across Jan. 1 to Feb. 27. No ice reported in December. No observer Sept. 4 to Nov. 1. Beginning May 26 observation made on new vertical gage about 100 yards below the site of the old staff gage.

Daily discharge, in second-feet, of North Fork of Malheur River near Beulah, Oreg., for 1910.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	56	1,570	540	395	95	46	30	30	.....	51	79
2	50	1,840	570	370	95	46	30	35	.....	51	79
3	38	1,570	540	322	87	46	30	40	.....	64	79
4	50	1,040	510	300	79	46	30	.....	.....	72	131
5	66	1,040	570	300	79	46	30	.....	.....	46	112
6	72	570	570	281	79	46	30	.....	.....	40	79
7	84	510	480	262	79	40	30	.....	.....	64	64
8	98	570	540	246	79	40	30	.....	.....	79	64
9	98	570	570	246	79	40	30	.....	.....	95	79
10	91	510	605	246	72	40	35	.....	.....	64	95
11	105	570	640	230	72	40	35	.....	51	64	79
12	105	720	640	215	72	40	35	.....	.....	64	79
13	105	800	605	174	64	35	35	.....	.....	64	64
14	105	880	540	174	64	35	35	.....	.....	64	79
15	98	1,080	540	174	64	35	35	.....	.....	64	79
16	91	1,040	540	150	58	30	40	.....	.....	64	79
17	91	1,040	480	162	58	30	40	.....	.....	72	79
18	98	1,120	450	150	58	30	40	.....	.....	79	79
19	105	1,300	450	150	51	30	40	.....	.....	72	64
20	98	4,900	422	150	51	30	40	.....	.....	51	79
21	98	3,140	422	150	51	30	30	.....	.....	64	64
22	98	2,700	450	140	51	30	30	.....	.....	64	51
23	91	1,620	422	130	46	30	30	.....	.....	79	40
24	84	1,300	450	130	46	30	30	.....	.....	79	30
25	122	1,040	450	130	46	30	30	.....	.....	95	17

Daily discharge, in second-feet, of North Fork of Malheur River near Beulah, Oreg., for 1910—Continued.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	196	800	450	131	46	30	30	.....	.....	79	10
27	345	720	422	131	46	30	30	.....	.....	40	7
28	720	640	422	122	46	30	30	.....	.....	64	5
29	.....	640	450	122	46	30	30	.....	.....	79	13
30	.....	570	450	112	46	30	30	.....	.....	79	17
31	.....	510	.....	112	.....	30	30	.....	.....	.....	51

NOTE.—Daily discharge determined from rating curves as follows: For the old chain gage, Jan. 1 to May 25, well defined between 45 and 550 second-feet, but only approximate above 2,500 second-feet; new staff gage, May 26 to Dec. 31, well defined between 50 and 160 second-feet. Discharge for January and from Feb. 1 to 27 estimated because of presence of ice. Low flow at end of December probably correct as the stream often freezes in the flat valley above the station and ice jams form which hold back the water for several days.

Monthly discharge of North Fork of Malheur River near Beulah, Oreg., for 1910.

[Drainage area, 436 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January [a]	.....	.....	50.0	.115	0.13	3,070	C.
February	720	38	124	.284	.30	6,890	C.
March	4,900	510	1,190	2.73	3.15	73,200	C.
April	640	422	506	1.16	1.29	30,100	A.
May	395	112	197	.452	.52	12,100	A.
June	95	46	63.5	.146	.16	3,780	A.
July	46	30	35.5	.081	.09	2,180	B.
August	40	30	32.6	.075	.09	2,000	C.
September [a]	.....	.....	42.0	.096	.11	2,500	C.
October [a]	.....	.....	50.0	.115	.13	3,070	C.
November	95	40	66.9	.153	.17	3,980	A.
December	131	5	62.1	.142	.16	3,820	B.
The year	4,900	5	203	.466	6.30	148,000	

[a] Estimated.

BULLY CREEK ABOVE VALE, OREG.

This station, which was first established August 10, 1903, was destroyed by flood and discontinued March 11, 1904, in favor of a station at the mouth of the creek. It was again established January 29, 1905, and maintained until March 31, 1907, when it was discontinued for lack of funds. It was located 13 miles above the mouth of the creek and 2 miles below the mouth of Cottonwood Creek. Records were kept during February and a part of March, 1910, by a company interested in irrigation development on Bully Creek. No discharge measurements were made during this period, but a curve has been used based on a measurement at the end of the year, and earlier high-water measurements.

Measurements are made from a cable located at the section of the staff gage, or by wading at low water. The channel is subject to change during floods and shifts by undercutting the banks as well as by scouring and filling the channel. The results are therefore not the best.

Discharge measurements of Bully Creek above Vale, Oreg., in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1910 Dec. 30	I. E. Oakes	35	20.2	1.22	20.4
1911 Apr. 23[a]	G. L. Parker	18.5	8.2	.97	5.07

[a] Measured by wading.

Daily gage height, in feet, and discharge, in second-feet, of Bully Creek above Vale, Oreg., for 1910.

[D B. Patterson, observer.]

Day.	February.		March.		Day.	February.		March.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1		80	4.6	1,480	16	2.0	140		
2	1.7	80	4.95	1,810	17	1.9	120		
3		92	5.35	2,220	18	1.9	120		
4		104	7.0	4,130	19	1.7	80		
5		117	4.65	1,520	20	1.7	80		
6	1.95	130	4.4	1,320	21		80		
7		127	4.85	1,710	22		80		
8		124	3.25	590	23	1.7	80		
9	1.9	120	4.8	1,660	24		90		
10		110	4.4	1,320	25	1.8	100		
11	1.8	100	4.25	1,220	26	2.3	215		
12	1.8	100	4.0	1,040	27	2.2	190		
13	1.7	80			28	4.1	1,110		
14	1.7	80			29				
15		110			30				
					31				

NOTE.—Daily discharge determined from a discharge-rating curve drawn through 1910 and 1911 low-water measurements parallel to the 1906 curve. These results are very uncertain for February as the channel may have shifted materially in the March flood, and they are also questionable for high-water stages, for no flood measurements were obtained and the parallel rating curve may not be applicable, as this section probably shifts by widening the channel.

Monthly discharge of Bully Creek above Vale, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
February	1,110	80	144	8,000	D.
Mar. 1–12	4,130	590	1,670	39,700	C.

WILLOW CREEK NEAR MALHEUR, OREG.

This station, which is located about 4 miles southeast of Malheur, was established March 19, 1910, by Jas. A. Greene & Co. (Inc.), constructing engineers for the Willow River Land & Water Co., near the site of the station maintained by the United States Geological Survey in 1905 and 1906.

The records show the discharge available for storage in what is known as reservoir No. 3 of the Willow Creek project, the dam of which is located in E. ½ NE. ¼ sec. 15, T. 14 S., R. 41 E.

Two gages were used in 1910, one in the SW. ¼ sec. 14, T. 14 S., R. 41 E., up to May 29, and another in the SW. ¼ sec. 5 after that date.

Measurements were made with a Lallie meter, using the rating furnished by the makers, and during high-water periods measurements were made daily except as noted. For low-water periods the discharge was measured by means of a weir.

Estimates of daily discharge have been furnished by Jas. A. Green & Co. (Inc.). The measurements were carefully made by the engineers of the company, the weirs were properly constructed, and the results should be reliable except possibly during a few days of the highest water in March.

Daily discharge, in second-feet, of Willow Creek near Malheur, Oreg., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	92.1	13.8	0.48	0.38	.....	.....	.....	.....	2.24
2	.....	88.1	14.9	.44	.36	.....	.....	.....	.....	2.24
3	.....	89.9	19.8	.49	.34	.....	.....	.....	.....	2.17
4	.....	83.2	37.6	.46	.32	.....	.....	.....	.....	3.39
5	.....	76.5	34.2	.46	.31	.....	.....	.....	.....	3.12
6	.....	72.9	31.0	.46	.30	.....	.....	.....	.....	2.85
7	.....	68.1	26.7	.48	.29	.....	.....	.....	.....	2.57
8	.....	71.7	21.4	.50	.28	.....	.....	.....	.....	2.64
9	.....	63.3	16.1	.50	.27	.....	.....	.....	.....	2.57
10	.....	65.6	16.0	.50	.23	.....	.....	.....	.....	2.72
11	.....	64.0	16.0	.50	.23	.....	.....	.....	.....	2.57
12	.....	62.3	12.9	.50	.22	.....	.....	.....	.....	2.94
13	.....	59.2	9.87	.50	.23	.....	.....	.....	.....	2.85
14	.....	53.9	9.40	.52	.24	.....	.....	.....	.....	2.94
15	.....	48.5	6.40	.80	.22	.....	.....	.....	.....	2.72
16	.....	45.7	5.44	.50	.22	.....	.....	.....	.....	2.85
17	.....	45.1	4.73	1.60	.....	.....	.....	.....	.....	2.57
18	.....	41.3	3.74	1.48	.....	.....	.....	.....	.....	1.07
19	129	38.2	3.76	1.35	.....	.....	.....	.....	.....	3.25
20	1,400	33.0	2.56	.74	.....	.....	.....	.....	.....	2.24
21	1,260	27.9	2.02	.74	.....	.....	.....	.....	.....	1.50
22	1,110	28.8	1.74	.67	.....	.....	.....	.....	.....	.65
23	966	29.5	1.34	.74	.....	.....	.....	.....	.....	3.00
24	821	27.5	1.20	.61	.....	.....	.....	.....	.....	4.45
25	676	25.3	1.20	.50	.....	.....	.....	.....	.....	4.12
26	532	19.7	.94	.48	.....	.....	.....	.....	.....	3.30
27	387	14.1	1.39	.46	.....	.....	.....	.....	.....	4.59
28	242	8.40	1.84	.44	.....	.....	.....	.....	.....	5.60
29	97.7	13.6	1.52	.42	.....	.....	.....	.....	1.44	4.45
30	93.8	12.6	.75	.40	.....	.....	.....	.....	2.30	3.30
31	93.0	.....	1.53	.....	.....	.....	.....	.....	.....	2.10

NOTE.—Daily discharge Mar. 19 to July 8 computed from daily discharge measurements with a Lallie meter except as follows: Mar. 20 to 28, discharge estimated from cross section of the stream and estimated mean velocity; Apr. 20, May 6 and 12, discharge interpolated; June 5 to 9 and possibly a few other days from May 30 to July 8 discharge estimated.

Discharge July 9 to Dec. 31 from computed flow over a 1.5-foot sharp-crested weir with end contractions.

Monthly discharge of Willow Creek near Malheur, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
March 19-31	1,400	93.0	601	15,500
April	92.1	8.40	49.0	2,920
May	37.6	.75	10.4	640
June	1.60	.40	.62	37
July [a]	.38		.24	15
August [b]			.17	10
September [b]			.18	11
October [b]			.18	11
November [c]	2.30		.31	18
December	5.60	.65	2.91	179
The period				19,300

[a] Mean July 17-31 estimated 0.20 second-foot. [b] Monthly mean estimated.
[c] Mean Nov. 1-28 estimated 0.20 second-foot from occasional readings on the weir.

WILLOW CREEK NEAR BROGAN, OREG.

This station, which is located at Cole bridge, at the site of the station formerly maintained by the Geological Survey, was established January 1, 1910, by engineers in the employ of Jas. A. Greene & Co. (Inc.), constructing engineers for the Willow River Land & Irrigation Co., at Dam No. 2 of the Willow Creek project in SW. ¼ sec. 27, T. 14 S., R. 42 E., and was moved to its present position March 21.

Records of daily gage heights and discharge have been furnished by Jas. A. Greene & Co.

Daily gage height, in feet, of Willow Creek near Brogan, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.7	0.6	1.06	3.65	1.7	0.7	0.5	0.3	0.2	0.4	0.5	0.2
2	.7	.7	1.08	3.60	1.6	.7	.5	.3	.2	.4	.5	.2
3	.7	.7	1.30	3.55	2.6	.7	.4	.2	.2	.4	.4	.2
4	.7	.8	1.70	3.50	3.1	.6	.4	.2	.2	.4	.4	.2
5	.7	.8	1.76	3.48	2.7	.6	.4	.2	.2	.4	.5	.2
6	.7	.7	2.30	3.44	2.55	.6	.4	.2	.2	.4	.5	.2
7	.7	.8	2.30	3.40	1.8	.6	.4	.2	.2	.4	.5	.2
8	.7	.8	2.60	3.38	1.8	.6	.4	.2	.2	.4	.5	.2
9	.8	.8	2.65	3.36	1.75	.6	.4	.2	.2	.4	.5	.2
10	.8	.8	2.40	3.34	1.75	.6	.3	.2	.3	.4	.5	.2
11	.8	.8	2.36	3.30	1.7	.5	.3	.2	.3	.4	.5	.2
12	.8	.8	2.40	3.26	1.6	.5	.3	.2	.3	.4	.5	.2
13	.8	.9	2.40	3.23	1.6	.5	.3	.2	.3	.4	.5	.2
14	.8	.9	2.46	3.15	1.5	.5	.3	.2	.3	.4	.5	.2
15	8	.8	2.46	3.06	1.4	.5	.3	.2	.3	.4	.4	.2
16	.8	.9	2.40	2.98	1.4	.5	.3	.2	.3	.4	.4	.2
17	.8	.8	2.40	2.90	1.3	.5	.3	.2	.4	.4	.4	.2
18	.7	.9	2.40	2.83	1.2	.5	.3	.2	.4	.4	.4	.2
19	.8	.8	3.60	2.75	1.0	.5	.3	.2	.4	.4	.4	.2
20	.8	.8	7.30	2.70	1.0	.5	1.0	.2	.4	.4	.5	.2
21	.8	.9	6.00	2.65	1.0	.5	1.0	.2	.4	.4	.5	.4
22	.7	.9	5.8	2.60	1.0	.5	.8	.2	.4	.4	.5	.1
23	.8	.9	5.3	2.58	.8	.5	.5	.2	.4	.4	.5	.5
24	.8	.9	5.0	2.55	.7	.5	.3	.2	.4	.4	.5	.4
25	.8	.9	4.6	2.50	.7	.5	.3	.2	.4	.4	.5	.2
26	.8	1.0	4.5	2.40	.7	.5	.3	.2	.4	.4	.5	.0
27	.9	1.0	4.3	2.30	.7	.5	.3	.2	.4	.4	.5	.5
28	.9	1.05	4.4	2.20	.7	.5	.3	.2	.4	.4	.5	.0
29	.8	.....	3.8	2.00	.7	.5	.3	.2	.4	.4	.5	.0
30	.8	.....	3.8	1.80	.7	.5	.3	.2	.4	.4	.5	.8
31	.9	.....	3.7	.....	.7	.....	.3	.2	.....	.4	.....	.8

Daily discharge, in second-feet, of Willow Creek near Brogan, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8	7	16	124	12	3	2	1	0.5	1.5	2	0.5
2	8	8	18	120	10	3	2	1	.5	1.5	2	.5
3	8	8	38	115	35	3	1.5	.5	.5	1.5	1.5	.5
4	8	9	70	110	60	2.5	1.5	.5	.5	1.5	1.5	.5
5	8	9	75	105	42	2.5	1.5	.5	.5	1.5	2	.5
6	8	8	150	100	29	2.5	1.5		.5	1.5	2	.5
7	8	9	150	95	15	2.5	1.5	.5	.5	1.5	2	.5
8	8	9	240	90	15	2.5	1.5	.5	.5	1.5	2	.5
9	9	9	260	85	13	2.5	1.5	.5	.5	1.5	2	.5
10	9	9	170	80	13	2.5	1	.5	1	1.5	2	.5
11	9	9	160	74	12	2	1	.5	1	1.5	2	.5
12	9	9	170	70	10	2	1	.5	1	1.5	2	.5
13	9	10	170	67	10	2	1	.5	1	1.5	2	.5
14	9	10	180	64	9	2	1	.5	1	1.5	2	.5
15	9	9	180	60	8	2	1	.5	1	1.5	1.5	.5
16	9	10	170	56	8	2	1	.5	1	1.5	1.5	.5
17	9	9	170	52	7	2	1	.5	1.5	1.5	1.5	.5
18	8	10	170	48	6	2	1	.5	1.5	1.5	1.5	.5
19	9	9	640	44	5	2	1	.5	1.5	1.5	1.5	.5
20	9	9	2,500	42	5	2	5	.5	1.5	1.5	2	.5
21	9	10	600	39	5	2	5	.5	1.5	1.5	2	1.8
22	8	10	400	36	5	2	4	.5	1.5	1.5	2	.2
23	9	10	310	34	4	2	2	.5	1.5	1.5	2	2.2
24	9	10	275	30	3	2	1	.5	1.5	1.5	2	1.8
25	9	10	220	27	3	2	1	.5	1.5	1.5	2	.5
26	9	13	210	24	3	2	1	.5	1.5	1.5	2	0
27	10	13	190	22	3	2	1	.5	1.5	1.5	2	2.2
28	10	15	200	20	3	2	1	.5	1.5	1.5	2	0
29	9	.....	140	17	3	2	1	.5	1.5	1.5	2	0
30	9	.....	140	15	3	2	1	.5	1.5	1.5	2	3.8
31	10	.....	130	.....	.....	.....	1	.5	.....	1.5	.....	3.8

Monthly discharge of Willow Creek near Brogan, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	10	8	9.0	553
February	15	7	9.6	533
March	2,500	16	274	16,800
April	124	15	62.2	3,700
May	60	3	11.7	719
June	3	2	2.2	131
July	5	1	1.5	92.2
August	1	.5	.5	30.7
September	1.5	.5	1.1	65.5
October	1.5	1.5	1.5	92.2
November	2.0	1.5	1.9	113
December	3.8	0.0	.9	55.3
The year	2,500	.0	31.1	22,900

PAYETTE RIVER BASIN.

GENERAL FEATURES.

Payette River rises in the northern and eastern portions of Boise County, Idaho, and flows in a general southwesterly direction to its junction with Snake River near Payette, Idaho. It is about 110 miles long and drains an area comprising approximately 3,565 square miles. Its basin is well wooded and mountainous and is similar to that of Boise River.

The principal tributaries of the Payette are its Middle and North forks. The low-water flow of the river is appropriated for irrigation in the valleys below Horseshoe Bend, but more than a million acre-feet of flood water runs to waste each year. Payette Lake, at the head of the North Fork, affords a good storage site.

PAYETTE RIVER NEAR HORSESHOE BEND, IDAHO.

This station, which is located on the main river in sec. 2, T. 7 N., R. 2 E., Boise meridian, about 10 miles below the junction of the North and South forks, at a point known as Jerusalem, 5 miles above Horseshoe Bend post office, and about 32 miles from Boise, the most convenient railway point, was established February 13, 1906.

No tributaries enter below the station except small creeks whose channels are dry the greater part of the year. Squaw Creek is the largest of these. Very little water is diverted above the station.

The inclined staff gage is on the right bank about 300 yards from E. R. Sherard's house. The gage datum has remained unchanged.

Discharge measurements are made from a cable near the gage. The gage heights are not affected by ice, but some irregularities in daily flow are caused by flushing during the logging season.

The following discharge measurement was made by O. W. Hartwell:

May 20, 1910: Width, 280 feet; area, 1,640 square feet; gage height, 8.53 feet; discharge, 10,100 second-feet.

Daily gage height, in feet, of Payette River near Horseshoe Bend, Idaho, for 1910.

[E. R. Sherard, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.5	5.0	8.2	10.0	9.25	5.75	4.6	4.0	4.0	3.9	5.0
2	4.4	4.5	5.0	8.0	9.65	9.0	5.75	4.5	4.0	4.2	3.9	4.8
3	4.3	4.5	5.7	8.2	9.0	8.6	5.7	4.5	4.0	4.2	3.9	5.0
4	4.3	4.4	6.0	7.9	8.8	8.5	5.6	4.4	4.0	5.2	3.9	5.2
5	4.3	4.4	6.6	7.65	8.65	8.35	5.55	4.4	4.0	4.6	3.9	5.0
6	4.2	4.4	6.4	7.5	8.55	8.25	5.45	4.3	3.9	4.4	3.9	5.0
7	4.2	4.4	6.4	7.7	8.5	8.05	5.4	4.3	3.9	4.2	4.0	4.9
8	4.2	4.4	6.5	8.0	8.9	7.9	5.35	4.3	3.9	4.2	4.2	4.8
9	4.3	4.5	6.5	8.2	9.45	7.75	5.35	4.3	3.9	4.2	4.7	4.7
10	4.3	4.5	6.5	8.35	9.8	7.55	5.3	4.3	3.9	4.1	4.6	4.7
11	4.4	4.5	6.6	8.6	10.0	7.45	5.25	4.2	3.9	4.1	4.7	4.6
12	4.4	4.6	6.6	9.3	9.9	7.4	5.25	4.2	3.9	4.1	5.2	4.6
13	4.5	4.6	6.6	9.95	9.85	7.3	5.25	4.2	3.9	4.2	5.2	4.4
14	4.5	4.6	6.7	9.5	9.85	7.25	5.2	4.2	4.4	4.2	4.9	4.4
15	4.6	4.7	6.9	9.3	9.6	7.2	5.2	4.2	4.6	4.1	4.7	4.4
16	4.6	4.7	7.15	9.2	9.5	7.2	5.15	4.2	4.6	4.1	4.6	4.3
17	4.6	4.7	7.3	8.5	9.25	7.15	5.1	4.2	4.5	4.2	4.5	4.2
18	4.7	4.7	7.6	8.7	9.1	7.05	5.05	4.1	4.5	4.2	4.5	4.2
19	4.7	4.6	7.95	8.8	8.85	6.9	5.05	4.1	4.4	4.1	4.5	4.3
20	4.7	4.6	8.3	9.45	8.6	6.8	5.05	4.1	4.4	4.1	4.7	4.3
21	4.9	4.55	8.75	9.5	8.55	6.65	5.0	4.1	4.2	4.1	4.8	4.4
22	5.0	4.5	9.4	9.55	8.6	6.55	5.0	4.1	4.2	4.1	5.0	4.4
23	5.0	4.4	9.7	9.6	8.7	6.4	4.95	4.1	4.1	4.1	5.0	4.5
24	5.0	4.5	9.3	9.8	8.85	6.3	4.95	4.1	4.0	4.1	5.3	4.5
25	4.9	4.6	8.65	10.0	8.9	6.25	4.95	4.0	4.0	4.1	5.0	4.5
26	4.9	4.7	8.3	10.2	8.95	6.2	4.9	4.0	4.0	4.1	4.8	4.55
27	4.8	4.7	8.0	10.4	9.2	6.15	4.9	4.0	4.0	4.0	4.7	4.55
28	4.8	4.9	7.8	10.5	9.35	6.05	4.85	4.0	4.0	4.0	4.5	4.55
29	4.7	.....	7.65	10.4	9.5	5.95	4.85	4.0	4.0	4.0	4.5	4.55
30	4.6	.....	7.5	10.2	9.4	5.85	4.85	4.0	4.0	4.0	4.7	4.55
31	4.6	.....	7.45	.....	9.4	.....	4.7	4.0	.....	4.0	.....	4.55

Daily discharge, in second-feet, of Payette River near Horseshoe Bend, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,320	1,420	2,120	9,190	14,600	12,200	3,400	1,550	875	875	795	2,120
2	1,300	1,420	2,120	8,630	13,400	11,500	3,400	1,420	875	1,070	795	1,820
3	1,180	1,420	3,310	9,190	11,500	10,300	3,310	1,420	875	1,070	795	2,120
4	1,180	1,300	3,880	8,360	10,900	10,000	3,120	1,300	875	2,430	795	2,430
5	1,180	1,300	5,150	7,710	10,400	9,610	3,030	1,300	875	1,550	795	2,120
6	1,070	1,300	4,710	7,320	10,200	9,330	2,850	1,180	795	1,300	795	2,120
7	1,070	1,300	4,710	7,840	10,000	8,770	2,760	1,180	795	1,070	875	1,970
8	1,070	1,300	4,930	8,630	11,200	8,360	2,680	1,180	795	1,070	1,070	1,820
9	1,180	1,420	4,930	9,190	12,800	7,970	2,680	1,180	795	1,070	1,680	1,680
10	1,180	1,420	4,930	9,610	13,900	7,450	2,590	1,180	795	965	1,550	1,680
11	1,300	1,420	5,150	10,300	14,600	7,200	2,510	1,070	795	965	1,680	1,550
12	1,300	1,550	5,150	12,400	14,200	7,070	2,510	1,070	795	965	2,430	1,550
13	1,420	1,550	5,150	14,400	14,100	6,820	2,510	1,070	795	1,070	2,430	1,300
14	1,420	1,550	5,380	13,000	14,100	6,700	2,430	1,070	1,300	1,070	1,970	1,300
15	1,550	1,680	5,840	12,400	13,300	6,570	2,430	1,070	1,550	965	1,680	1,300
16	1,550	1,680	6,440	12,100	13,000	6,570	2,350	1,070	1,550	965	1,550	1,180
17	1,550	1,680	6,820	10,000	12,200	6,440	2,270	1,070	1,420	1,070	1,420	1,070
18	1,680	1,680	7,580	10,600	11,800	6,200	2,200	965	1,420	1,070	1,420	1,070
19	1,680	1,550	8,500	10,900	11,000	5,840	2,200	965	1,300	965	1,420	1,180
20	1,680	1,550	9,470	12,800	10,300	5,610	2,200	965	1,300	965	1,680	1,180
21	1,970	1,480	10,700	13,000	10,200	5,266	2,120	965	1,070	965	1,820	1,300
22	2,120	1,420	12,700	13,100	10,300	5,040	2,120	965	1,070	965	2,120	1,300
23	2,120	1,300	13,600	13,300	10,600	4,710	2,040	965	965	965	2,120	1,420
24	2,120	1,420	12,400	13,900	11,000	4,500	2,040	965	875	965	2,590	1,420
25	1,970	1,550	10,400	14,600	11,200	4,400	2,040	875	875	965	2,120	1,420
26	1,970	1,680	9,470	15,200	11,300	4,290	1,970	875	875	965	1,820	1,480
27	1,820	1,680	8,630	15,800	12,100	4,180	1,970	875	875	875	1,680	1,480
28	1,820	1,970	8,100	16,200	12,500	3,980	1,900	875	875	875	1,420	1,480
29	1,680	.....	7,710	15,800	13,000	3,780	1,900	875	875	875	1,420	1,480
30	1,550	.....	7,320	15,200	12,700	3,600	1,900	875	875	875	1,680	1,480
31	1,550	.....	7,200	.....	12,700	.....	1,680	875	.....	875	.....	1,480

NOTE.—Daily discharge determined from a rating curve derived from discharge measurements made during 1909 to 1911; curve well defined below 14,000 second-feet.

Monthly discharge of Payette River near Horseshoe Bend, Idaho, for 1910.

[Drainage area, 2,240 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	2,120	1,070	1,530	0.683	0.79	94,100	A.
February	1,970	1,300	1,500	.670	.70	83,300	A.
March	13,600	2,120	6,920	3.09	3.56	425,000	A.
April	16,200	7,320	11,700	5.22	5.82	696,000	A.
May	14,600	10,000	12,100	5.40	6.23	744,000	A.
June	12,200	3,600	6,810	3.04	3.39	405,000	A.
July	3,400	1,680	2,420	1.08	1.24	149,000	A.
August	1,550	875	1,070	.478	.55	65,800	A
September	1,550	795	994	.444	.50	59,100	A.
October	2,430	875	1,060	.473	.55	65,200	A.
November	2,590	795	1,550	.692	.77	92,200	A.
December	2,430	1,070	1,560	.696	.80	95,900	A.
The year	16,200	795	4,110	1.83	24.90	2,970,000	

NORTH FORK OF PAYETTE RIVER AT LARDO, IDAHO.

This station, which is located in sec. 8, T. 18 N., R. 3 E., Boise meridian, about one-fourth mile below the lake outlet and about the same distance from the Lardo post office, was established August 25, 1908.

The original gage was located about 1¼ miles below the lake outlet. The present gage was established October 14, 1908, and is a vertical staff on the left bank.

The car and cable equipment from which discharge measurements are made is about half a mile below the gage. During low water measurements are made by wading.

The relation between gage height and discharge is not affected by the presence of ice.

Discharge measurements of North Fork of Payette River at Lardo, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 12	O. W. Hartwell	130	532	5.70	2,310
14	do	130	507	5.50	2,250
15	do	129	481	5.35	2,110
15	do	129	481	5.30	2,110
July 13	A. C. Price	99	120	2.52	154
14	do	99	115	2.45	145
Oct. 3	O. W. Hartwell	40	27	1.52	19
Nov. 3	Lynn Crandall	26	18.5	1.30	7.4
3	do	26	18.8	1.28	7.1
1911.					
May 10	J. C. Dort	110	329	4.35	1,110
11	do	110	320	4.22	1,050
June 3	do	124	502	5.90	2,280
25	O. W. Hartwell	128	502	5.60	2,290
July 23	do	102	170	3.00	291
25	do	102	159	2.88	246
Sept. 11	Lynn Crandall	93	69.2	1.90	39.0

Daily gage height, in feet, of North Fork of Payette River at Lardo, Idaho, for 1910.

[Neal Boydstun, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.6	2.5	2.5	3.25	5.0	5.0	2.85	2.05	1.8	1.45	1.25	2.6
2	2.6	2.5	2.5	3.3	4.8	4.8	2.8	2.05	1.8	1.45	1.15	2.55
3	2.6	2.5	2.5	3.3	4.65	4.7	2.8	2.05	1.75	1.5	1.3	2.55
4	2.55	2.45	2.5	3.3	4.45	4.5	2.75	2.05	1.75	1.55	1.25	2.55
5	2.55	2.45	2.55	3.3	4.4	4.5	2.7	2.05	1.75	1.55	1.35	2.55
6	2.55	2.4	2.55	3.3	4.3	4.5	2.7	2.05	1.7	1.55	1.4	2.5
7	2.5	2.4	2.55	3.3	4.5	4.4	2.7	2.05	1.7	1.55	1.5	2.5
8	2.5	2.4	2.55	3.35	4.9	4.3	2.65	2.05	1.65	1.55	1.55	2.5
9	2.5	2.4	2.55	3.4	5.4	4.25	2.65	2.05	1.6	1.55	1.65	2.5
10	2.5	2.4	2.55	3.4	6.0	4.2	2.6	2.05	1.6	1.55	1.8	2.45
11	2.5	2.4	2.55	3.85	6.0	4.1	2.6	2.05	1.55	1.55	1.95	2.45
12	2.5	2.4	2.55	4.0	5.8	4.1	2.55	2.0	1.55	1.55	2.1	2.45
13	2.5	2.4	2.55	4.3	5.5	4.0	2.45	2.0	1.55	1.55	2.05	2.4
14	2.5	2.4	2.55	4.35	5.5	3.95	2.45	2.0	1.55	1.55	2.05	2.4
15	2.5	2.35	2.55	4.2	5.5	3.9	2.4	2.0	1.55	1.55	2.05	2.35
16	2.5	2.35	2.55	4.15	5.35	3.8	2.4	2.0	1.55	1.55	2.1	2.3
17	2.5	2.4	2.6	4.1	5.15	3.7	2.4	1.95	1.55	1.55	2.1	2.25
18	2.5	2.4	2.6	4.35	5.0	3.65	2.35	1.95	1.55	1.55	2.15	2.2
19	2.5	2.4	2.7	4.6	4.9	3.6	2.35	1.95	1.55	1.6	2.15	2.1
20	2.5	2.45	2.9	4.8	4.8	3.5	2.3	1.95	1.5	1.6	2.2	2.1
21	2.5	2.45	3.0	4.8	4.8	3.45	2.25	1.95	1.5	1.6	2.25	2.1
22	2.55	2.45	3.25	4.95	4.6	3.4	2.2	1.95	1.5	1.6	2.3	2.1
23	2.55	2.45	3.3	5.1	4.5	3.35	2.15	1.9	1.45	1.65	2.3	2.1
24	2.55	2.45	3.35	5.3	5.2	3.3	2.1	1.9	1.45	1.65	2.35	2.05
25	2.55	2.5	3.45	5.4	5.2	3.25	2.1	1.9	1.45	1.6	2.4	2.05
26	2.55	2.5	3.45	5.6	5.2	3.2	2.1	1.85	1.45	1.6	2.4	2.05
27	2.55	2.5	3.4	5.1	5.3	3.1	2.1	1.85	1.45	1.6	2.45	2.05
28	2.55	2.5	3.4	5.8	5.4	3.0	2.05	1.85	1.45	1.55	2.5	2.05
29	2.55	.....	3.35	5.8	5.1	2.95	2.05	1.8	1.45	1.5	2.55	2.05
30	2.55	.....	3.3	5.5	5.1	2.9	2.05	1.8	1.45	1.4	2.55	2.1
31	2.5	.....	3.25	.....	5.0	.....	2.05	1.8	.....	1.3	.....	2.1

Daily discharge, in second-feet, of North Fork of Payette River at Lardo, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	173	148	148	400	1,740	1,740	244	64	38	14	60	173
2	173	148	148	424	1,540	1,540	229	68	38	14	40	150
3	173	148	148	424	1,400	1,450	229	64	34	16	74	160
4	160	136	148	424	1,220	1,270	214	64	34	20	60	160
5	160	136	160	424	1,180	1,270	200	64	34	20	92	160
6	160	125	160	424	1,100	1,270	200	64	30	20	11	148
7	148	125	160	424	1,270	1,180	200	64	30	20	16	148
8	148	125	160	449	1,640	1,100	186	64	26	20	20	148
9	148	125	160	474	2,140	1,050	186	64	23	20	26	148
10	148	125	160	474	2,760	1,010	173	64	23	20	38	136
11	148	125	160	745	2,760	930	173	64	20	20	52	136
12	148	125	160	855	2,550	930	160	58	20	20	71	136
13	148	125	160	1,100	2,240	855	136	58	20	20	64	125
14	148	125	160	1,140	2,240	818	136	58	20	20	64	125
15	148	115	160	1,010	2,240	780	125	58	20	20	64	115
16	148	115	160	970	2,500	710	125	58	20	20	71	105
17	148	125	173	930	1,890	645	125	52	20	20	71	96
18	148	125	173	1,140	1,740	615	115	52	20	20	79	87
19	148	125	200	1,360	1,640	585	115	52	20	23	79	71
20	148	136	260	1,540	1,540	528	105	52	16	23	87	71
21	148	136	295	1,540	1,540	501	96	52	16	23	96	71
22	160	136	400	1,690	1,360	474	87	52	16	23	105	71
23	160	136	424	1,840	1,270	449	79	47	14	26	105	71
24	160	136	449	2,040	1,940	424	71	47	14	26	115	64
25	160	148	501	2,140	1,940	400	71	47	14	23	125	64
26	160	148	501	2,340	1,940	377	71	42	14	23	125	64
27	160	148	474	1,840	2,040	334	71	42	14	23	136	64
28	160	148	474	2,550	2,140	295	64	42	14	20	148	64
29	160	.....	449	2,550	1,840	278	64	38	14	16	160	64
30	160	.....	424	2,240	1,840	260	64	38	14	11	160	71
31	148	.....	400	.....	1,740	.....	64	38	.....	74	.....	71

NOTE.—Daily discharge determined from a rating curve derived from measurements made during 1909 to 1911; curve well defined above 100 second-feet and fairly well defined below.

Monthly discharge of North Fork of Payette River at Lardo, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	173	148	155	9,530	A.
February	148	115	133	7,390	A.
March	501	148	262	16,100	A.
April	2,550	400	1,200	71,400	A.
May	2,760	1,100	1,840	113,000	A.
June	1,740	260	802	47,700	A.
July	244	64	135	8,300	A.
August	64	38	54.4	3,340	B.
September	38	14	21.7	1,290	B.
October	26	7.4	19.7	1,210	B.
November	160	4.0	70.7	4,210	B.
December	173	64	108	6,640	A.
The year	2,760	4.0	400	290,000	

LAKE FORK OF PAYETTE RIVER NEAR McCALL, IDAHO.

This station, which is located in sec. 13, T. 18 N., R. 3 E., at Waini's ranch, about one-fourth mile below Little Payette Lake and about 5 miles from McCall post office, was established September 28, 1909.

One small creek enters between this station and the outlet of the lake. No water is diverted above, but a small canal heads about one-fourth mile below the staff gage.

The vertical staff gage is attached to a pine tree on the left bank about one-fourth mile below the lake. Its datum has remained constant.

High-water measurements are made from a cable located about 200 feet below the gage. Low-water discharge measurements can be made by wading about one-fourth mile upstream from the gage.

The gage heights are very little affected by ice and not at all by artificial control above, but may at times show the effect of backwater from the dam at the head of the irrigation canal below.

A good rating curve has been developed from measurements made during 1909 to 1911.

Discharge measurements of Lake Fork of Payette River near McCall, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 3	O. W. Hartwell	62	48	0.81	23
Nov. 4	Lynn Crandall	28	46	.89	29
4	do	28	48	.88	28
1911.					
May 11	J. C. Dort	73	243	3.08	360
12	do	73	242	3.08	355
June 3	do	78	377	4.82	1,030
25	O. W. Hartwell	77	314	4.10	677
July 24	do	73	149	1.85	115
Sept. 11	Lynn Crandall	26	40.2	.84	22.5

Daily gage height, in feet, of Lake Fork of Payette River near McCall, Idaho, for 1910.

[Andrew Waini, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.35	1.25	1.3	2.4	4.9	4.5	2.1	0.9	0.45	0.65	0.95	1.8
2	1.35	1.25	1.35	2.5	4.8	5.5	2.0	.85	.45	.8	.95	1.8
3	1.35	1.2	1.4	2.5	3.85	5.0	1.95	.8	.45	.8	.95	1.8
4	1.35	1.25	1.4	2.5	4.0	4.5	1.95	.8	.45	1.1	1.0	1.75
5	1.35	1.2	1.45	2.5	3.9	4.55	1.9	.75	.45	1.1	1.0	1.75
6	1.35	1.2	1.5	2.5	3.9	4.35	1.85	.75	.4	1.1	1.0	1.75
7	1.35	1.2	1.55	2.8	3.85	4.2	1.85	.7	.4	1.1	1.0	1.75
8	1.35	1.2	1.65	2.9	3.85	4.0	1.75	.7	.4	1.1	1.0	1.75
9	1.35	1.2	1.65	3.0	4.0	3.7	1.6	.7	.4	1.1	1.1	1.7
10	1.35	1.2	1.65	3.1	4.5	3.5	1.6	.7	.4	1.1	1.25	1.7
11	1.35	1.2	1.7	4.0	4.9	3.4	1.55	.7	.4	1.0	1.5	1.6
12	1.35	1.2	1.7	3.5	4.5	3.4	1.5	.7	.35	1.0	2.05	1.6
13	1.3	1.2	1.7	3.5	4.1	3.2	1.5	.65	.3	1.0	2.0	1.6
14	1.3	1.2	1.7	3.45	4.4	3.1	1.45	.65	.3	1.0	2.0	1.6
15	1.25	1.2	1.7	3.4	3.95	3.0	1.4	.6	.4	1.0	2.0	1.6
16	1.25	1.2	1.7	3.4	3.65	3.0	1.35	.6	.5	1.0	2.0	1.55
17	1.2	1.2	1.7	4.05	3.65	2.95	1.3	.6	.7	1.05	2.0	1.45
18	1.2	1.25	1.8	4.1	3.65	2.9	1.3	.55	.7	1.05	2.0	1.4
19	1.2	1.25	2.15	4.2	4.0	2.9	1.25	.55	.7	1.05	2.0	1.45
20	1.2	1.25	2.5	4.4	4.0	2.8	1.3	.55	.7	1.0	1.95	1.35
21	1.2	1.25	2.85	4.4	3.9	2.7	1.3	.55	.7	1.0	2.0	1.3
22	1.5	1.25	3.0	4.4	3.65	2.6	1.2	.55	.7	1.0	2.0	1.15
23	1.85	1.25	3.0	4.4	3.75	2.5	1.2	.55	.7	1.0	2.0	1.0
24	1.85	1.25	3.0	4.4	4.1	2.4	1.15	.55	.7	1.0	2.0	.95
25	1.85	1.2	2.9	4.8	4.5	2.35	1.15	.5	.7	1.0	2.0	.9
26	1.85	1.25	2.8	5.0	4.55	2.35	1.1	.5	.65	1.0	2.0	.85
27	1.85	1.25	2.75	5.0	4.5	2.3	1.05	.4	.65	1.0	1.95	.85
28	1.85	1.25	2.75	5.0	4.3	2.3	1.0	.4	.6	1.0	1.95	.9
29	1.85	.....	2.5	5.0	4.2	2.2	1.0	.5	.6	1.0	1.95	.9
30	1.4	.....	2.5	5.0	4.1	2.15	.95	.5	.55	1.0	1.95	.95
31	1.3	.....	2.5	.....	4.1	.....	.9	.5	.....	.95	.....	.95

Daily discharge, in second-feet, of Lake Fork of Payette River near McCall, Idaho, for 1909–10.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1909.					1909.				
1	.....	48	48	164	16	.....	48	64	68
2	.....	48	60	221	17	.....	44	64	78
3	.....	52	112	119	18	.....	41	64	78
4	.....	56	112	119	19	.....	41	73	78
5	.....	56	112	119	20	.....	44	94	73
6	.....	56	100	119	21	.....	44	73	73
7	.....	68	94	112	22	.....	41	140	73
8	.....	68	88	112	23	.....	44	324	73
9	.....	64	88	112	24	.....	41	362	73
10	.....	73	83	112	25	.....	41	472	73
11	.....	60	83	126	26	.....	41	362	73
12	.....	56	78	106	27	.....	41	311	73
13	.....	64	73	94	28	26	41	211	73
14	.....	48	64	94	29	35	44	192	64
15	.....	52	64	88	30	44	44	173	64
					31	.....	46	.....	64

NOTE.—Daily discharge determined from a well-defined rating curve derived from measurements 1909 to 1911. Estimates for 1909 supersede those published in Water-Supply Paper U. S. Geol. Survey No. 272.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	60	52	56	201	1,070	858	148	29	10	17	32	106
2	60	52	60	221	1,010	1,460	133	26	10	24	32	106
3	60	48	64	221	586	1,130	126	24	10	24	32	106
4	60	52	64	221	642	858	126	24	10	41	35	100
5	60	48	68	221	604	883	119	22	10	41	35	100
6	60	48	73	221	604	787	112	22	8	41	35	100
7	60	48	78	287	586	722	112	19	8	41	35	100
8	60	48	88	311	586	642	100	19	8	41	35	100
9	60	48	88	336	642	534	83	19	8	41	41	94
10	60	48	88	362	858	472	83	19	8	41	52	94
11	60	48	94	642	1,070	443	78	19	8	35	73	83
12	60	48	94	472	858	443	73	19	7	35	140	83
13	56	48	94	472	682	388	73	17	6	35	133	83
14	56	48	94	458	810	362	68	17	6	35	133	83
15	52	48	94	443	623	336	64	15	8	35	133	83
16	52	48	94	443	518	336	60	15	11	35	133	78
17	48	48	94	662	518	324	56	15	19	38	133	68
18	48	52	106	682	518	311	56	13	19	38	133	64
19	48	52	156	722	642	311	52	13	19	38	133	68
20	48	52	221	810	642	287	56	13	19	35	126	60
21	48	52	299	810	604	264	56	13	19	35	133	56
22	73	52	336	810	518	242	48	13	19	35	133	44
23	112	52	336	810	551	221	48	13	19	35	133	35
24	112	52	336	810	682	201	44	13	19	35	133	32
25	112	48	311	1,010	858	192	44	11	19	35	133	29
26	112	52	287	1,130	883	192	41	11	17	35	133	26
27	112	52	276	1,130	858	182	38	8	17	35	126	26
28	112	52	276	1,130	764	182	35	8	15	35	126	29
29	112	.....	221	1,130	722	164	35	11	15	35	126	29
30	64	.....	221	1,130	682	156	32	11	13	35	126	32
31	56	.....	221	.....	682	.....	29	11	.....	32	.....	32

NOTE.—Daily discharge determined from a rating curve well defined between 20 and 1,100 second-feet, and derived from measurements made during 1909 to 1911.

Monthly discharge of Lake Fork of Payette River near McCall, Idaho, for 1909–10.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1909.					
October	73	41	50.2	3,090	A.
November	472	48	141	8,390	A.
December	221	64	95.7	5,880	A.
1910.					
January	112	48	69.5	4,270	A.
February	52	48	49.9	2,770	A.
March	336	56	161	9,900	A.
April	1,130	201	610	36,300	A.
May	1,070	518	706	43,400	A.
June	1,460	156	463	27,600	A.
July	148	29	71.9	4,420	A.
August	29	8	16.2	996	B.
September	19	6	12.8	762	C.
October	41	17	35.3	2,170	A.
November	140	32	97.9	5,830	A.
December	106	26	68.7	4,220	A.
The year	1,460	6	197	143,000	

NOTE.—Estimates for 1909 supersede those published in Water-Supply Paper U. S. Geol. Survey No. 272.

WEISER RIVER BASIN.

GENERAL FEATURES.

Weiser River rises in the northeastern part of Washington County, Idaho, flows southwestward about 40 miles, then nearly due west for 10 miles to its junction with the Snake River at the town of Weiser.

The elevation of the upper part of the basin is 6,500 to 7,000 feet above sea level. At the mouth of the river, about 70 miles below, the elevation is only 2,100 feet. The descent is made chiefly in rapids and small falls in the canyons. In the valleys the fall is very slight, and in many places the current is sluggish. On the mountains the snow which forms the greater part of the precipitation remains far into the spring, and on some of the highest peaks nearly all the year round. The river is subject to sudden, spasmodic floods.

WEISER RIVER NEAR WEISER, IDAHO.

This station, which is located in sec. 25, T. 11 N., R. 4 W., Boise meridian, about 500 feet below a section house on the Pacific & Idaho Northern Railroad, and about 10 miles above Weiser, was established October 7, 1910. Records are also available for a point near this station for December 6, 1894, to December 31, 1904.

The station is about 5 miles above the mouth of Mann Creek, 10 miles above the mouth of Monroe Creek, above the headworks of the Galloway ditch, and below all other important tributaries.

The station is equipped with an inclined staff gage and a cable and car.

No discharge measurements were made during 1910.

Ice exists to some extent during the winter months, but probably did not affect the gage heights for December, 1910.

Discharge measurements of Weiser River near Weiser, Idaho, in 1911.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 15	Lynn Crandall	156	232	3.08	530
June 9	J. C. Dort	195	1,190	6.30	3,940
21	O. W. Hartwell	190	855	4.61	1,810
July 8	do	182	593	3.16	595

NOTE.—Includes only measurements made during 1911 which were used to define a curve from which the discharge in 1910 was computed.

Daily gage height, in feet, and discharge, in second-feet, of Weiser River near Weiser, Idaho, for 1910.

[C. A. Norris, observer.]

Day.	October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.5	279	4.3	1,500
2			2.5	279	3.9	1,140
3			2.4	243	3.8	1,050
4			2.5	279	7.6	5,860
5			2.5	279	6.1	3,670
6			2.5	279	4.8	2,030
7	2.5	279	2.5	279	4.1	1,310
8	2.4	243	2.6	319	4.0	1,220
9	2.4	243	2.7	361	3.8	1,050
10	2.4	243	3.0	500	3.9	1,140
11	2.3	210	3.0	500	3.7	970
12	2.3	210	3.1	550	4.2	1,400
13	2.3	210	3.4	735	4.1	1,310
14	2.3	210	3.0	500	3.9	1,140
15	2.3	210	2.8	405	3.7	970
16	2.3	210	2.7	361	3.5	810
17	2.3	210	2.6	319	3.4	735
18	2.4	243	2.6	319	3.3	665
19	2.6	319	2.6	319	3.2	605
20	2.6	319	2.7	361	3.2	605
21	2.5	279	2.7	361	3.0	500
22	2.5	279	3.7	970	3.0	500
23	2.4	243	3.9	1,140	2.8	405
24	2.4	243	4.6	1,810	3.0	500
25	2.5	279	3.7	970	3.0	500
26	2.5	279	3.7	970	3.1	550
27	2.5	279	3.3	665	2.9	451
28	2.5	279	3.0	500	2.9	451
29	2.5	279	3.5	810	3.0	500
30	2.5	279	4.6	1,810	2.9	451
31	2.5	279			2.9	451

NOTE.—A little shore ice present Dec. 30. Daily discharge determined from a rating curve derived from measurements made in 1911; curve well defined above 450 second-feet.

Monthly discharge of Weiser River near Weiser, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Oct. 7–31	319	210	254	12,600	B.
November	1,810	243	582	34,600	A.
December	5,860	405	1,110	68,200	A.

WEST FORK OF WEISER RIVER NEAR FRUITVALE, IDAHO.

This station, which is located at the Walker ranch in sec. 9, T. 17 N., R. 1 W., Boise meridian, about 1½ miles from Fruitvale, and the same distance above the mouth of the stream, was established October 5, 1910.

The station is below all tributaries of the West Fork.

The gage is a vertical staff.

Low-water measurements are made by wading. At higher stages discharge measurements are made from a gaging bridge.

Discharge measurements of West Fork of Weiser River near Fruitvale, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 5	O. W. Hartwell	33	26	2.60	21.0
Nov. 7	Lynn Crandall	20	11	2.53	12.7
Dec. 29	do	24	17	2.70	20.5

NOTE.—Measurements made by wading.

Daily gage height, in feet, of West Fork of Weiser River near Fruitvale, Idaho, for 1910.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	2.4	2.8	11	2.4	3.0	2.9	21	2.5	2.6	2.6
2	.....	2.5	2.9	12	2.4	3.2	2.8	22	2.5	2.5	2.5
3	.....	2.5	2.9	13	2.5	2.8	2.7	23	2.5	2.7	2.8
4	.....	2.4	3.4	14	2.5	2.7	2.7	24	2.5	2.6	2.6
5	2.6	2.3	3.1	15	2.5	2.6	2.6	25	2.5	2.6	2.8
6	2.5	2.4	2.9	16	2.5	2.6	2.7	26	2.5	2.5	2.9
7	2.5	2.5	2.9	17	2.5	2.6	2.8	27	2.5	2.6	2.6
8	2.5	2.5	2.8	18	2.5	2.6	2.7	28	2.5	2.7	2.8
9	2.4	2.5	2.9	19	2.5	2.5	2.6	29	2.4	2.7	2.6
10	2.4	2.6	2.7	20	2.5	2.5	2.6	30	2.4	2.8	2.6
								31	2.4	.....	2.7

Daily discharge, in second-feet, of West Fork of Weiser River near Fruitvale, Idaho, for 1910.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	9	32	11	9	49	40	21	14	17	17
2	.....	14	40	12	9	68	32	22	14	11	11
3	.....	14	40	13	14	32	24	23	14	24	32
4	.....	9	88	14	14	24	24	24	14	17	17
5	21	5.5	58	15	14	17	17	25	14	17	32
6	14	9	40	16	14	17	24	26	14	11	37
7	14	11	40	17	14	17	32	27	14	17	14
8	14	11	32	18	14	17	24	28	14	24	28
9	9	11	40	19	14	11	17	29	9	24	14
10	9	17	24	20	14	11	17	30	9	32	20
								31	9	.....	20

NOTE.—Discharges based on rating curves drawn through the measurements and in general parallel to later curves based on measurements made in 1910–12. They are fairly well defined.

Monthly discharge of West Fork of Weiser River near Fruitvale, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
October 5–31	21	9	13.0	697	B.
November	68	5.5	18.9	1,120	B.
December	88	11	29.7	1,830	B.

MIDDLE FORK OF WEISER RIVER NEAR MIDDLE FORK, IDAHO.

This station, which is located at the Shaw ranch in sec. 10, T. 15 N., R. 1 W., Boise meridian, three-fourths mile from Middle Fork post office and 3 miles above the mouth of the stream, was established October 4, 1910.

No tributaries enter below the station. The Council Mesa Orchard ditch diverts water from a point about 6 miles upstream. The drainage area is 84 square miles.

The station is equipped with an inclined staff gage and a gaging bridge located just back of Shaw's house.

Discharge measurements of Middle Fork of Weiser River near Middle Fork, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Nov. 6	Lynn Crandall	33	31	2.46	21.2
Dec. 28[a]	do	36	48	2.92	39.7
28[b]	do	34	40	2.67	40.6

[a] Mush ice at control. [b] No ice at control.

Daily gage height, in feet, of Middle Fork of Weiser River near Middle Fork, Idaho, for 1910.

[Amos Shaw, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	2.4	2.9	11	2.4	2.9	2.8	21	2.4	3.1	2.6
2	.....	2.4	2.9	12	2.5	3.0	2.8	22	2.45	3.2	2.6
3	.....	2.5	3.2	13	2.4	2.7	2.7	23	2.4	3.2	2.6
4	2.6	2.4	3.2	14	2.4	2.6	2.7	24	2.4	2.9	2.6
5	2.5	2.4	3.0	15	2.4	2.5	2.7	25	2.4	2.8	2.6
6	2.5	2.5	2.9	16	2.4	2.5	2.7	26	2.4	2.8	2.6
7	2.4	2.5	2.9	17	2.5	2.5	2.7	27	2.4	3.2	2.6
8	2.4	3.3	2.9	18	2.45	2.5	2.7	28	2.4	3.0	2.6
9	2.4	2.6	2.8	19	2.4	2.5	2.6	29	2.4	2.9	2.6
10	2.4	2.8	2.8	20	2.4	2.5	2.6	30	2.4	2.9	2.6
								31	2.4	.....	2.7

NOTE.—Records affected to a slight extent by the presence of ice during the last few days of December.

Daily discharge, in second-feet, of Middle Fork of Weiser River near Middle Fork, Idaho, for 1910.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	17	66	11	17	66	54	21	17	95	33
2	.....	17	66	12	24	80	54	22	20	112	33
3	.....	24	112	13	17	43	43	23	17	112	33
4	33	17	112	14	17	33	43	24	17	66	33
5	24	17	80	15	17	24	43	25	17	54	33
6	24	24	66	16	17	24	43	26	17	54	33
7	17	24	66	17	24	24	43	27	17	112	33
8	17	130	66	18	20	24	43	28	17	80	33
9	17	33	54	19	17	24	33	29	17	66	33
10	17	54	54	20	17	24	33	30	17	66	33
								31	17	.....	35

NOTE.—Discharges based on a fairly well defined rating curve drawn through the 1910 unaffected measurements and parallel to the later curves for 1911 and 1912.

Monthly discharge of Middle Fork of Weiser River near Middle Fork, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
October 4-31	33	17	18.6	1,030	B.
November	130	17	51.3	3,050	B.
December	112	33	49.6	3,050	B.

CRANE CREEK NEAR MIDVALE, IDAHO.

This station, which is located in sec. 19, T. 12 N., R. 2 W., Boise meridian, about 300 feet below the dam under construction by the Crane Creek Irrigation Co., about 100 feet below the tunnel which diverts the flow around the dam, and about 12 miles southeast of Midvale, was established October 30, 1910.

The station is below all important tributaries of Crane Creek except Last Chance Creek. The drainage area is 269 square miles.

The station is equipped with a staff gage in three sections, and a car and cable.

Ice forms at the station during the winter months, but probably did not seriously affect the gage heights for December, 1910.

The station has been maintained in cooperation with the Crane Creek Irrigation Co.

Discharge measurements of Crane Creek near Midvale, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 30	Lynn Crandall	.....	.....	1.26	1.0
Dec. 25	.....do	22	59	2.13	28
1911.					
Jan. 27	Crandall and Vaughn	40	105	2.60	59.6
27[a]	.....do	40	105	2.59	70.2
31	Lynn Crandall	80	450	8.0	3,330
Feb. 1	.....do	70	296	6.0	1,570
12	.....do	47	112	2.76	85.2
13[a]	Z. N. Vaughn	30	83.7	2.60	75.0
June 22	O. W. Hartwell	45	99.5	2.52	69.4
26	.....do	.....	33.9	1.64	7.5
July 10	.....do	14.5	8.0	1.50	2.7
10	.....do	14.5	8.1	1.50	2.8

[a] Measurement made with Lallie current meter.

NOTE.—Ice present in the stream at the time of the measurements on Jan. 27.

The above measurements were used to define a rating curve from which the daily discharges for 1910 were computed.

Daily gage height, in feet, and discharge, in second-feet, of Crane Creek near Midvale, Idaho, for 1910.

[Gilbert Thornton, observer.]

Day.	November.		December.		Day.	November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1	1.7	10	4.6	706	16	2.1	26	3.0	150
2	1.2	1	3.9	411	17	1.8	13	2.8	111
3	2.0	22	8.9	4,240	18	1.4	2	2.5	63
4	1.8	13	7.2	2,560	19	2.0	22	2.5	63
5	1.4	2	4.9	856	20	2.3	41	2.4	51
6	2.0	22	4.4	616	21	5.4	1,150	2.2	33
7	2.0	22	4.5	660	22	4.2	531	1.7	10
8	2.1	26	3.6	306	23	5.3	1,080	.....	15
9	2.0	22	4.0	450	24	3.4	246	.....	20
10	3.1	171	3.8	374	25	2.6	77	2.1	26
11	4.0	450	4.6	706	26	2.2	33	2.0	22
12	4.5	660	4.0	450	27	2.0	22	1.8	13
13	3.2	194	3.7	339	28	2.6	77	2.1	26
14	2.0	22	3.4	246	29	5.7	1,340	2.0	22
15	4.0	450	3.2	194	30	4.9	856	1.9	17
					31	.....	.....	2.3	41

NOTE.—Gage heights probably affected by ice to a slight extent during the latter part of December.

Daily discharges were determined from a rating curve derived from measurements in 1910 and 1911; curve fairly well defined.

Monthly discharge of Crane Creek near Midvale, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
November	1,340	1	253	15,100	B.
December	4,240	10	445	27,400	B.

POWDER RIVER BASIN.

GENERAL FEATURES.

Powder River, which drains the eastern slope of the Blue Mountains, rises in the extreme western portion of Baker County, Oreg., flows west, then north around the end of Elkhorn Ridge through Baker City to the town of North Powder, where it turns abruptly to the southeast, and empties into Snake River in the east-central part of Baker County.

The general elevation of the headwaters is 6,000 feet above sea level; that of the valley is 3,300 feet. Sumpter is 4,415 feet above sea level, and Baker City 3,586 feet. The most important tributary streams are North Powder River, which drains the east slope of Elkhorn ridge, and Eagle Creek, which drains the southern part of the Powder River Mountains and empties into the Powder near its mouth. The total drainage area of Powder River at the mouth is 1,660 square miles; at Baker City it is 341 square miles.

At the headwaters the country is mountainous and heavily forested, and the principal industry is mining and lumbering. The valley of the Powder has not been greatly developed, although a number of irrigation ditches are in operation. Any extensive development will involve the construction of storage reservoirs, for which facilities are not lacking.

The mean annual rainfall at Baker City is 15 inches; in the headwater region it is probably twice that amount, the greater part falling during the winter in the form of snow. The determination of stream flow in this area is rendered somewhat difficult during the winter, as the streams are icebound for weeks at a time.

POWDER RIVER AT SALISBURY, OREG.

This station, which is located 10 miles above Baker City and one-fourth mile below Salisbury, a station on the Sumpter Valley Railroad, above all important diversions for the Powder River valley, was established December 20, 1903.

A small ditch, which carries considerable water during the spring and early summer, diverts water about one-fourth mile above the gage, but the amount is small as compared to the flow in the river.

The records indicate the low-water flow available for irrigation in the valley surrounding Baker City. The flood waters could be conserved by building a dam in the "Narrows" about 6 miles above the station, and impounding water in the lower portion of Sumpter Valley, but such development would necessitate a relocation of the Sumpter Valley Railroad. The drainage area was originally heavily forested, but is now being logged off rapidly.

The vertical staff gage is on the right bank, about 15 feet above a wagon bridge, from which discharge measurements are made. It was changed during 1910, and gage heights refer to a datum 0.56 foot higher than that formerly used.

During the spring and fall the gage heights are affected by melting snow from the Blue Mountains, the afternoon gage heights being always higher than the morning readings. During the winter months the stream frequently remains frozen for long periods. Attempt has been made to develop ice-rating curves, but the results have not been very satisfactory.

Discharge measurements of Powder River at Salisbury, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 15	L. R. Allen	43	101	3.53	484
Sept. 18[a]	F. C. Ebert	23	8.4	1.32	6.5

[a] Measurement made by wading.

Daily gage height, in feet, of Powder River at Salisbury, Oreg., for 1910.

[R. M. Garrett, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.05	1.45	1.8	3.45	3.4	2.7	.....	.....	.....	1.35	1.85	2.05
2	2.0	1.45	2.4	3.6	3.4	2.65	.....	.....	.....	1.35	1.85	2.1
3	1.2	1.55	3.9	3.7	3.5	2.6	.....	.....	.....	1.45	1.85	2.1
4	1.3	1.55	3.8	3.7	3.5	2.55	.....	.....	.....	1.45	1.75	1.9
5	1.3	1.55	3.8	3.6	3.45	2.55	.....	.....	.....	1.4	1.75	1.95
6	1.3	1.55	3.9	3.7	3.4	2.4	.....	.....	.....	1.45	1.8	1.85
7	1.35	1.55	3.8	3.8	3.4	2.4	.....	.....	.....	1.5	1.8	1.85
8	1.4	1.45	3.7	3.8	3.35	2.3	.....	.....	.....	1.5	1.85	1.85
9	1.35	1.45	3.5	3.75	3.35	2.2	.....	.....	.....	1.4	1.9	1.8
10	1.4	1.5	2.55	3.75	3.3	2.2	.....	.....	.....	1.4	1.9	1.8
11	1.4	1.5	2.7	3.85	3.3	2.15	.....	.....	.....	1.45	1.85	1.8
12	1.4	1.5	2.8	3.9	3.25	2.1	.....	.....	.....	1.45	1.8	1.75
13	1.4	1.5	3.35	4.4	3.2	2.1	.....	.....	.....	1.35	1.85	1.8
14	1.4	1.5	3.95	4.35	3.25	2.0	.....	.....	.....	1.35	1.9	1.8
15	1.4	1.5	4.05	4.5	3.1	2.0	.....	.....	.....	1.4	1.95	1.9
16	1.4	1.45	4.2	4.6	3.0	1.9	.....	.....	1.3	1.35	1.9	1.85
17	1.5	1.5	4.55	4.6	3.0	1.9	.....	.....	1.3	1.45	1.75	1.85
18	1.55	1.5	5.2	4.7	2.9	1.85	.....	.....	1.3	1.45	1.75	1.9
19	1.55	1.5	4.95	4.4	2.9	1.85	.....	.....	1.4	1.4	1.8	1.75
20	1.5	1.45	6.65	4.15	2.85	1.8	.....	.....	1.4	1.5	1.85	1.85
21	1.5	1.5	6.0	3.9	2.85	1.75	.....	.....	1.4	1.45	1.8	1.75
22	1.5	1.5	5.45	4.05	2.8	1.75	.....	.....	1.5	1.45	1.9	1.75
23	1.45	1.55	5.15	4.05	2.8	1.7	.....	.....	1.5	1.45	1.95	1.85
24	1.45	1.55	4.65	3.95	2.7	1.65	.....	.....	1.4	1.5	1.95	1.8
25	1.55	1.6	4.2	3.9	2.7	1.65	.....	.....	1.3	1.5	1.9	1.7
26	1.55	1.65	4.1	4.2	2.8	1.6	.....	.....	1.3	1.55	1.95	1.7
27	1.55	1.65	4.0	4.05	2.9	1.6	.....	.....	1.3	1.65	1.95	1.7
28	1.55	1.75	3.9	3.9	2.9	1.55	.....	.....	1.35	1.65	1.9	1.65
29	1.55	.....	3.8	3.85	2.8	1.35	.....	.....	1.4	1.75	1.85	1.65
30	1.45	.....	3.55	3.8	2.8	1.3	.....	.....	1.45	1.75	1.85	1.65
31	1.45	.....	3.45	.....	2.7	.....	.....	.....	.....	1.85	.....	1.65

NOTE.—Gage heights refer to new datum established in 1910, 0.56 foot above the old datum. River frozen Jan. 1 to Mar. 1; ice 12 inches thick Feb. 7 and 18 inches thick Feb. 24. Gage read to the bottom of the ice or a little above the bottom.

Daily discharge, in second-feet, of Powder River at Salisbury, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	79	14	45	454	436	214	.....	.....	.....	9	51	79
2	71	14	143	508	436	201	.....	.....	.....	9	51	87
3	4	21	620	544	472	188	.....	.....	.....	14	51	87
4	7	21	582	544	472	176	.....	.....	.....	14	40	57
5	7	21	582	508	454	176	.....	.....	.....	11	40	64
6	7	21	620	544	436	143	.....	.....	.....	14	45	51
7	9	21	582	582	436	143	.....	.....	.....	17	45	51
8	11	14	544	582	419	123	.....	.....	.....	17	51	51
9	9	14	472	563	419	105	.....	.....	.....	11	57	45
10	11	17	176	563	402	105	.....	.....	.....	11	57	45
11	11	17	214	601	402	96	.....	.....	.....	14	51	45
12	11	17	242	620	385	87	.....	.....	.....	14	45	40
13	11	17	419	810	368	87	.....	.....	.....	9	51	45
14	11	17	639	791	385	71	.....	.....	.....	9	57	45
15	11	17	677	848	336	71	.....	.....	.....	11	64	57
16	11	14	734	886	304	57	.....	.....	7	9	57	51
17	17	17	867	886	304	57	.....	.....	7	14	40	51
18	21	17	1,110	924	272	51	.....	.....	7	14	40	57
19	21	17	1,020	810	272	51	.....	.....	11	11	45	40
20	17	14	1,660	715	257	45	.....	.....	11	17	51	51
21	17	17	1,420	620	257	40	.....	.....	11	14	45	40
22	17	17	1,210	677	242	40	.....	.....	17	14	57	40
23	14	21	1,100	677	242	34	.....	.....	17	14	64	51
24	14	21	900	639	214	30	.....	.....	11	17	64	45
25	21	25	734	620	214	30	.....	.....	7	17	57	34
26	21	30	696	734	242	25	.....	.....	7	21	64	34
27	21	30	658	677	272	25	.....	.....	7	30	64	34
28	21	40	620	620	272	21	.....	.....	9	30	57	30
29	21	.....	582	601	242	9	.....	.....	11	40	51	30
30	14	.....	490	582	242	7	.....	.....	14	40	51	30
31	14	.....	454	.....	214	.....	.....	.....	.....	51	.....	30

NOTE.—Daily discharge determined from a rather poorly defined rating curve, subject to revision. Open channel rating curve has been applied to gage readings as reported by observer throughout January and February; results probably too low.

Monthly discharge of Powder River at Salisbury, Oreg., for 1910.

[Drainage area, 230 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.
January	79	4.0	17.8	0.077	0.09	1,090
February	40	14	19.4	.084	.09	1,080
March	1,660	45	671	2.92	3.37	41,300
April	924	454	658	2.86	3.19	39,200
May	472	214	333	1.45	1.67	20,500
June	214	7.0	83.6	.363	.40	4,970
July	.....	.....	7.0	.030	.03	430
August	.....	.....	5.0	.022	.02	307
September	.....	.....	8.6	.038	.04	512
October	51	9.0	17.3	.075	.09	1,060
November	64	40	52.1	.227	.25	3,100
December	87	30	48.3	.210	.24	2,970
The year	1,660	4	161	.700	9.48	117,000

POWDER RIVER NEAR NORTH POWDER, OREG.

This station, which was established March 9, 1909, is located at the dam site in the lower end of Thief Valley, 7 miles east of North Powder, Oreg. A large irrigation project is proposed whereby the waters

of Powder River will be stored above this point and used for the reclamation of approximately 40,000 acres of land.

About 1 mile above the station a temporary dam is constructed each year that raises the water to a sufficient height to subirrigate the adjoining lands. For this reason the river is under more or less artificial control during the extreme low-water period.

The gage, which consists of an inclined low-water section and a vertical section, is located in the measuring section at the cable. Discharge measurements are made from a standard cable. The bed of the stream is of bowlders and gravel and is not likely to change except in extreme high water. Both banks are high and will not overflow.

Discharge measurements of Powder River near North Powder, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 14	L. R. Allen	72	254	4.99	999
Sept. 19	F. C. Ebert	36	23.4	1.10	15

Daily gage height, in feet, of Powder River near North Powder, Oreg., for 1910.

[M. B. Fisk, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	.....	.....	4.75	5.3	2.55	.....	0.7	.....	1.15	1.3	1.75
2	2.4	.....	.....	4.75	5.15	2.55	.....	.7	.....	1.15	1.3	1.8
3	2.5	.....	.....	.....	4.2	2.3	.....	.6	.....	1.15	1.3	1.85
4	2.5	.....	.....	4.7	4.6	2.15	.....	.65	.....	1.2	1.3	1.9
5	2.6	.....	.....	4.65	4.45	2.0	.....	.5	.....	1.2	1.3	1.95
6	2.5	.....	.....	4.65	4.2	1.9	.....	.5	.....	1.25	1.3	2.00
7	2.4	.....	.....	4.55	4.0	1.8	.....	.5	.....	1.25	1.3	1.95
8	2.5	.....	4.3	4.5	4.95	1.7	.....	.5	.....	1.25	1.3	1.9
9	2.5	.....	4.75	4.4	5.0	1.6	0.9	.....	.....	1.25	1.3	1.95
10	2.5	.....	4.55	4.65	5.1	1.5	.9	.....	.....	1.25	1.45	1.95
11	2.6	.....	4.25	5.1	4.9	1.45	.9	.....	0.75	1.2	1.55	1.8
12	2.5	.....	4.8	5.35	4.7	1.35	.9	.....	.8	1.2	1.6	1.7
13	2.6	.....	5.2	5.5	4.5	1.3	.9	.....	.95	1.2	1.6	1.7
14	2.65	.....	5.0	5.5	4.4	1.25	.9	.....	.9	1.2	1.6	1.7
15	.....	.....	4.7	5.35	4.1	1.2	.8	.....	.9	1.25	1.6	1.7
16	.....	.....	5.3	5.2	3.8	1.2	.8	.....	1.0	1.25	1.55	1.7
17	.....	.....	5.45	5.2	3.5	1.2	.8	.....	1.15	1.3	1.55	1.65
18	.....	.....	5.65	5.1	3.2	1.2	.8	.....	1.15	1.3	1.55	1.6
19	.....	.....	6.1	5.2	3.0	1.15	.8	.....	1.15	1.3	1.55	1.6
20	.....	.....	6.75	5.35	2.9	1.1	.8	.....	1.1	1.3	1.55	1.55
21	.....	.....	9.85	5.45	2.95	1.05	.8	.....	1.1	1.25	1.6	1.55
22	.....	.....	9.15	5.4	2.65	1.0	.8	.....	1.1	1.25	1.7	1.65
23	.....	.....	8.6	5.4	2.6	1.0	.8	.....	1.1	1.25	1.75	1.65
24	.....	.....	7.6	5.4	2.55	1.0	.8	.....	1.1	1.25	1.8	1.75
25	.....	.....	7.0	5.8	2.6	1.0	.8	.....	1.1	1.25	1.75	1.75
26	.....	.....	6.45	5.9	2.7	.....	.8	.....	1.05	1.2	1.6	1.7
27	.....	.....	6.0	6.0	2.7	.....	.8	.....	1.1	1.25	1.65	1.6
28	.....	.....	5.45	5.45	2.65	.....	.8	.....	1.1	1.25	1.65	1.55
29	.....	.....	5.2	5.4	2.65	.....	.8	.....	1.1	1.3	1.65	1.6
30	.....	.....	4.7	5.5	2.6	.....	.8	.....	1.1	1.3	1.7	1.65
31	.....	.....	4.55	.....	2.5	.....	.8	.....	.....	1.3	.....	1.65

NOTE.—River frozen Jan. 1 to about Mar. 5, when the water began running over the ice, which gradually broke away. Channel clear of ice and the first unaffected gage reading obtained Mar. 8. No ice noted in December and the gage heights do not indicate any effect. Channel dry from Aug. 8 to Sept. 6, when the water began to run, but did not reach the gage.

Daily discharge, in second-feet, of Powder River near North Powder, Oreg., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	915	1,100	252	9	3.3	0	17	24	68
2	.....	915	1,050	252	9	3.3	0	17	24	76
3	.....	906	734	187	9	1.6	Dry.	17	24	85
4	.....	898	864	151	9	2.4	0	19	24	94
5	.....	881	814	115	9	.7	0	19	24	104
6	.....	881	734	94	9	.7	0	22	24	115
7	.....	847	670	76	8	.7	0	22	24	104
8	766	830	983	61	8	.7	0	22	24	94
9	915	798	1,000	48	8	0	0	22	24	104
10	847	881	1,030	38	8	0	0	22	34	104
11	750	1,030	966	34	8	0	4.4	19	43	76
12	932	1,120	898	27	8	0	5.4	19	48	61
13	1,070	1,170	830	24	8	0	9.5	19	48	61
14	1,000	1,170	798	22	8	0	8	19	48	61
15	898	1,120	702	19	5.4	0	8	22	48	61
16	1,100	1,070	606	19	5.4	0	11	22	43	61
17	1,150	1,070	514	19	5.4	0	17	24	43	54
18	1,220	1,030	426	19	5.4	0	17	24	43	48
19	1,380	1,070	370	17	5.4	0	17	24	43	48
20	1,620	1,120	343	15	5.4	0	15	24	43	43
21	2,860	1,150	356	13	5.4	0	15	22	48	43
22	2,580	1,140	278	11	5.4	0	15	22	61	54
23	2,360	1,140	265	11	5.4	0	15	22	68	54
24	1,960	1,140	252	11	5.4	0	15	22	76	68
25	1,720	1,280	265	11	5.4	0	15	22	68	68
26	1,500	1,310	291	11	5.4	0	13	19	48	61
27	1,340	1,340	291	10	5.4	0	15	22	52	48
28	1,150	1,150	278	10	5.4	0	15	22	52	43
29	1,070	1,140	278	10	5.4	0	15	24	52	48
30	898	1,170	265	10	5.4	0	15	24	61	54
31	847	.....	239	.....	5.4	0	.....	24	.....	54

NOTE.—Daily discharge determined from a rating curve well defined between 15 and 1,000 second-feet. Discharge for January and February can be estimated approximately by taking about twice the discharge at Salisbury and interpolating for the period Mar. 1 to 7.

Monthly discharge of Powder River near North Powder, Oreg., for 1910.

[Drainage area, 826 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
March 8-31	2,860	750	1,330	1.61	1.44	63,300	A.
April	1,340	798	1,060	1.28	1.43	63,100	A.
May	1,100	239	611	.740	.85	37,600	A.
June	252	10	53.2	.064	.07	3,170	B.
July	9	5.4	6.77	.0082	.009	416	C.
August	3.3	0	.432	.00052	.001	27	D.
September	17	0	8.68	.011	.01	516	C.
October	24	17	21.3	.026	.03	1,310	A.
November	76	24	42.9	.052	.06	2,550	A
December	115	43	68.3	.083	.10	4,200	C.
The period	.....	.....	.....	.....	.....	176,000	

EAGLE CREEK NEAR BAKER CITY, OREG.

This station, which is located 700 feet below the confluence of West Eagle Creek with Eagle Creek, at a point about 35 miles northeast of Baker City from which it is reached by stage, and about 6 miles above the mouth of East Fork of Eagle Creek, was established May 20, 1909, by O. C. Finkelnburg, of the Powder Valley Irrigation Co. The records determine amount of water available for diversion over a divide into Balm Creek, on which there is a reservoir site.

The Sparta ditch—an old hydraulic mining ditch—diverts water from Eagle Creek and West Eagle Creek some distance above their confluence, and carries it around the west side of the valley in the vicinity of Sparta. On July 24, 1911, this ditch was carrying 14.5 second-feet.

Discharge measurements have been made by wading and from a foot bridge 5 feet below the vertical staff gage.

The bed of the stream is composed of gravel and cobblestones and is very rough and probably remained permanent during 1909 and the early part of 1910. About the end of July a large quantity of material from construction work on the head gates of the canal above was sluiced into the channel and after that time the gage heights do not afford an index of the discharge. This stream probably freezes over during the winter, but thus far no winter records have been obtained.

The following discharge measurement was made by W. W. Atwater, of the Powder Valley Irrigation Co.:

August 16: Gage height, 1.75 feet; discharge, 16.9 second-feet. The gage height was affected by mud in the channel.

Daily gage height, in feet, and discharge, in second-feet, of Eagle Creek near Baker City, Oreg., for 1910.

[O. C. Finkelnburg, observer.]

Day.	Mar.		Apr.		May.		June.		July.		Aug.	Sept.
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Gage height.
1	1.65	57	2.3	190	3.1	540	3.5	740	2.3	190	1.7	1.75
2	1.75	70	2.4	225	3.0	490	3.2	590	2.3	190	1.7	1.75
3	1.75	70	2.25	175	3.1	540	3.1	540	2.3	190	1.7	1.75
4	1.75	70	2.25	175	2.95	465	3.05	515	2.25	175	1.7	1.75
5	1.75	70	2.3	190	2.9	440	3.0	490	2.25	175	1.7	1.75
6	1.75	70	2.3	190	3.0	490	3.0	490	2.2	160	1.7	1.75
7	1.7	63	2.35	208	3.0	490	2.95	465	2.2	160	1.7	1.75
8	1.7	63	2.4	225	3.1	540	2.85	415	2.1	135	1.7	1.75
9	1.65	57	2.55	280	3.4	690	2.9	440	2.05	124	1.7	1.75
10	1.65	57	2.7	345	3.8	905	3.05	515	2.0	113	1.8	1.75
11	1.7	63	3.0	490	3.5	740	3.1	540	2.0	113	1.8	.....
12	1.8	77	3.1	540	3.4	690	2.9	440	1.95	103	1.8	.....
13	1.8	77	3.0	490	3.3	640	2.85	415	1.9	93	1.8	.....
14	1.85	85	2.8	390	3.2	590	2.85	415	1.9	93	1.8	.....
15	1.9	93	2.75	368	3.2	590	2.8	390	1.9	93	1.8	.....
16	2.0	113	2.8	390	.....	590	2.8	390	1.9	93	1.8	.....
17	2.05	124	2.95	465	.....	590	2.8	390	1.9	93	1.8	.....
18	2.3	190	3.1	540	.....	590	2.6	300	1.9	93	1.75	.....
19	2.5	260	3.3	640	.....	590	2.6	300	1.85	85	1.75	.....
20	2.8	390	3.4	690	.....	590	2.5	260	1.85	85	1.75	.....
21	2.7	345	3.25	615	.....	590	2.5	260	1.85	85	1.75	.....
22	2.6	300	3.3	640	.....	640	2.4	225	1.8	77	1.75	.....
23	2.6	300	3.4	690	.....	700	2.35	208	1.8	77	1.75	.....
24	2.5	260	3.4	690	3.5	740	2.35	208	1.8	77	1.75	.....
25	2.4	225	3.4	690	3.5	740	2.4	225	1.75	70	1.75	.....
26	2.3	190	3.6	795	3.2	590	2.45	242	1.7	63	1.75	.....
27	2.25	175	3.5	740	3.2	590	2.45	242	1.7	63	1.75	.....
28	2.2	160	3.4	690	3.1	540	2.45	242	1.7	63	1.75	.....
29	2.15	148	3.3	640	3.1	540	2.4	225	1.6	51	1.75	.....
30	2.15	148	3.35	665	3.2	590	2.35	208	1.55	40	1.75	.....
31	2.15	148	.....	.....	3.6	795	.....	.....	1.7	40	1.75	.....

NOTE.—Gage heights after about July 30 affected by mud which was sluiced into the stream during the construction of a diversion dam above, and do not indicate the discharge.

Daily discharge determined from a fairly well defined rating curve; results probably too high as conditions for measurement are poor. Discharge July 30 and 31 estimated to complete record for month.

Monthly discharge of Eagle Creek near Baker City, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	390	57	146	8,980	B.
April	795	175	469	27,900	B.
May	905	440	608	37,400	B.
June	740	208	378	22,500	B.
July	190	[a] 40	105	6,460	B.
The period	.....	.....	.....	103,000	

[a] Estimated.

SALMON RIVER BASIN.

SALMON RIVER AT WHITEBIRD, IDAHO.

This station, which is located at the ferry at Whitebird, Idaho, just below Whitebird Creek, and below all important tributaries, was established August 18, 1910. The station may be reached by driving or by stage from Grangeville, Idaho.

The drainage area is 13,600 square miles.

The river has a large amount of fall in its lower course.

An inclined staff gage is located near the ferry. Measurements are made from a car on the ferry cable. Measuring conditions are good. The channel is probably permanent and it is believed that excellent results can be obtained.

Discharge measurements of Salmon River at Whitebird, Idaho, in 1910–11.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 18	Allen and Davenport	283	1,640	2.26	4,500
Oct. 12	F. C. Ebert	300	2,380	3.94	7,980
1911.					
Mar. 6	J. P. Martin	305	1,860	1.95	3,910
May 27[a]	F. C. Ebert	390	4,680	9.90	30,300
June 22[a]	do	436	7,290	16.05	62,500
July 20	E. W. Kramer	340	3,520	6.27	14,600
Nov. 3	Beebe and Leidl	335	2,060	2.35	4,600
22	J. C. Beebe	330	2,110	2.60	5,130

[a] Surface velocity observed and coefficient of 0.85 used.

Daily gage height, in feet, and discharge, in second-feet, of Salmon River at Whitebird, Idaho, for 1910.

[Samuel Overton, observer.]

Day.	August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.2	4,310	2.15	4,230	2.4	4,630	3.1	6,020
2			2.15	4,230	2.25	4,390	2.4	4,630	2.9	5,580
3			2.15	4,230	2.3	4,470	2.4	4,630	3.0	5,800
4			2.15	4,230	2.8	5,370	2.45	4,720	3.0	5,800
5			2.15	4,230	3.25	6,350	2.5	4,800	3.0	5,800
6			2.15	4,230	3.0	5,800	2.3	4,470	2.9	5,580
7			2.1	4,150	2.9	5,580	2.25	4,390	2.9	5,580
8			2.1	4,150	2.8	5,370	2.4	4,630	3.0	5,800
9			2.05	4,080	2.75	5,270	2.85	5,480	2.9	5,580
10			2.0	4,000	2.7	5,170	2.8	5,370	2.6	4,980
11			2.0	4,000	2.6	4,980	3.0	5,800	2.7	5,170
12			1.95	3,920	2.5	4,800	3.8	7,620	2.6	4,980
13			2.0	4,000	2.5	4,800	3.7	7,380	2.5	4,800
14			2.0	4,000	2.5	4,800	3.5	6,920	2.3	4,470
15			2.0	4,000	2.6	4,980	3.4	6,690	1.9	3,850
16			2.1	4,150	2.55	4,890	3.1	6,020	1.7	3,570
17			2.4	4,630	2.6	4,980	2.8	5,370	1.5	3,290
18	2.25	4,390	2.7	5,170	2.6	4,980	2.85	5,480	1.5	3,290
19	2.2	4,310	2.65	5,080	2.8	5,370	2.9	5,580	1.6	3,430
20	2.15	4,230	2.65	5,080	2.85	5,480	2.9	5,580	1.8	3,710
21	2.1	4,150	2.45	4,720	2.6	4,980	3.0	5,800	1.7	3,570
22	2.05	4,080	2.65	5,080	2.5	4,800	3.0	5,800	1.9	3,850
23	2.0	4,000	2.7	5,170	2.45	4,720	3.1	6,020	2.1	4,150
24	2.0	4,000	2.6	4,980	2.4	4,630	3.2	6,240	2.2	4,310
25	2.0	4,000	2.4	4,630	2.4	4,630	3.1	6,020	2.4	4,630
26	2.0	4,000	2.3	4,470	2.45	4,720	3.0	5,800	2.3	4,470
27	2.05	4,080	2.25	4,390	2.5	4,800	2.8	5,370	2.4	4,630
28	2.0	4,000	2.2	4,310	2.4	4,630	2.7	5,170	2.3	4,470
29	2.1	4,150	2.2	4,310	2.35	4,550	2.9	5,580	2.1	4,150
30	2.1	4,150	2.2	4,310	2.35	4,550	3.0	5,800	2.0	4,000
31	2.15	4,230			2.3	4,470			2.1	4,150

NOTE.—Daily discharges were computed from a rating curve based on 1910 and 1911 discharge measurements, and which is well defined above 3,500 second-feet.

Monthly discharge of Salmon River at Whitebird, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
August 18–31	4,390	4,000	4,130	115,000	A.
September	5,170	3,920	4,410	262,000	A.
October	6,350	4,230	4,950	304,000	A.
November	7,620	4,390	5,590	333,000	A.
December	6,020	3,290	4,630	285,000	A.

PAHSIMEROI RIVER NEAR GOLDBURG, IDAHO.

This station, which is located in sec. 19, T. 11 N., R. 24 E., Boise meridian, three-fourths of a mile northwest of McJilton's ranch, and near Goldburg post office, was established January 30, 1910.

The station is about 2 miles above the mouth of Burnt Creek. Below Burnt Creek the water sinks into the ground and the water users below the mouth of Goldburg Creek have constructed Wells ditch and diverted the water from Pahsimeroi River into Goldburg Creek. It then flows down Goldburg Creek and into Pahsimeroi River, thus being passed around the sinks.

A temporary gage was established on January 30, 1910. On April 12 a permanent gage was established and the records from the temporary gage referred to the permanent gage by comparative readings.

Discharge measurements are made by wading or from a cable.

Ice forms to a thickness of several feet in midwinter and the stream becomes practically dry.

Discharge measurements of Pahsimeroi River near Goldburg, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 13	O. W. Hartwell	16	9	5.60	9
22	Thomas Latimer, jr	16	11	5.70	12
23	do	16	12	5.72	13
24	do	16	13	5.80	18
28	do	19	18	6.08	38
May 3	do	18	14	5.89	24
4	do	18	14	5.87	22
6	do	18	14	5.83	22
7	do	18	15	5.90	25
10	do	24	32	6.70	130
11	do	21	26	6.41	82
12	do	22	26	6.44	83
16	do	20	22	6.20	57
18	do	20	22	6.18	51
20	do	20	22	6.19	52
Oct. 2	H. L. Stoner	17	12	5.75	18
2	do	17	12	5.75	17

Daily gage height, in feet, of Pahsimeroi River near Goldburg, Idaho, for 1910.

[E. E. McJilton, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.2	5.5	5.5	6.0	7.2	6.5	6.0	5.7	5.8	5.7	5.7
2	.....	5.2	5.6	5.5	5.9	6.9	6.5	6.0	5.7	.....	5.7	5.7
3	.....	5.2	5.5	5.4	5.9	6.5	6.4	5.9	5.7	5.8	5.7	5.7
4	.....	5.4	5.5	4.9	5.9	6.3	6.5	5.9	5.7	5.8	5.7	5.7
5	.....	5.4	5.5	5.4	5.9	6.3	6.5	5.8	5.7	5.7	5.7	5.7
6	.....	5.4	5.4	5.5	5.9	6.3	6.5	5.8	5.7	5.7	5.7	5.7
7	.....	5.5	5.5	5.5	5.9	6.3	6.5	5.8	5.7	5.7	5.7	5.8
8	.....	5.5	5.5	5.5	6.1	6.3	6.5	5.8	5.7	5.7	5.6	5.8
9	.....	5.5	5.5	5.6	6.3	6.2	6.4	5.8	5.7	5.7	5.6	5.8
10	.....	5.5	5.5	5.6	6.7	6.3	6.4	5.8	5.7	5.7	5.6	5.7
11	.....	5.5	5.4	5.6	6.4	6.5	6.4	5.8	5.7	5.7	5.6	5.8
12	.....	5.5	5.4	5.7	6.4	6.7	6.3	5.8	5.7	5.7	5.5	5.8
13	.....	5.5	5.4	5.6	6.4	6.5	6.3	5.8	5.7	5.7	5.5	5.7
14	.....	5.4	5.5	5.6	6.4	6.5	6.3	5.8	5.7	5.7	5.5	5.8
15	.....	5.5	5.5	5.2	6.3	6.5	6.4	5.8	5.7	5.7	5.5	5.8
16	.....	5.4	5.5	5.5	6.3	6.5	6.4	5.8	5.9	5.7	5.6	5.8
17	.....	5.4	5.5	5.6	6.2	6.5	6.4	5.7	6.5	5.7	5.6	5.8
18	.....	5.5	5.5	5.7	6.3	6.5	6.4	5.7	6.3	5.7	5.6	5.8
19	.....	5.4	5.6	5.8	6.3	6.4	6.3	5.8	6.0	5.7	5.6	5.8
20	.....	5.4	5.6	5.8	6.2	6.5	6.3	5.8	6.0	5.7	5.6	5.7
21	.....	5.4	5.6	5.8	6.1	6.5	6.2	5.8	6.0	5.7	5.7	5.6
22	.....	5.4	5.6	5.7	6.1	6.5	6.2	5.8	5.9	5.7	5.7	5.5
23	.....	5.4	5.6	5.7	6.4	6.5	6.2	5.7	5.9	5.7	5.7	5.4
24	.....	5.5	5.6	5.9	6.7	6.6	6.2	5.7	5.9	5.7	5.7	5.4
25	.....	5.4	5.6	6.0	6.7	6.5	6.1	5.7	5.9	5.7	5.7	5.3
26	.....	5.4	5.5	6.0	6.4	6.5	6.1	5.7	5.8	5.7	5.7	5.3
27	.....	5.4	5.5	6.1	6.5	6.5	6.1	5.7	5.8	5.7	5.7	5.2
28	.....	5.4	5.5	6.1	6.3	6.5	6.1	5.7	5.8	5.7	5.7	5.1
29	.....	.....	5.6	6.0	6.3	6.5	6.0	5.7	5.8	5.7	5.7	5.0
30	5.4	.....	5.6	6.0	6.7	6.4	6.0	5.7	5.8	5.7	5.7	4.9
31	5.4	.....	5.5	.....	6.9	.....	6.0	5.7	.....	5.7	.....	4.7

NOTE.—Ice reported 2 feet thick Dec. 31. Relation between gage height and discharge probably affected by the presence of ice from about Dec. 7 to 31.

Daily discharge, in second-feet, of Pahsimeroi River near Goldburg, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.5	7	7	34	228	95	34	14	19	14	14
2	.....	2.5	10	7	26	168	95	34	14	19	14	14
3	.....	2.5	7	5	26	95	80	26	14	19	14	14
4	.....	5	7	.7	26	66	95	26	14	19	14	14
5	.....	5	7	5	26	66	95	19	14	14	14	14
6	.....	5	5	7	26	66	95	19	14	14	14	14
7	.....	7	7	7	26	66	95	19	14	14	14	10
8	.....	7	7	7	43	66	95	19	14	14	10	10
9	.....	7	7	10	66	54	80	19	14	14	10	10
10	.....	7	7	10	130	66	80	19	14	14	10	10
11	.....	7	5	10	80	95	80	19	14	14	10	10
12	.....	7	5	14	80	130	66	19	14	14	7	10
13	.....	7	5	10	80	95	66	19	14	14	7	10
14	.....	5	7	10	80	95	66	19	14	14	7	10
15	.....	7	7	2.5	66	95	80	19	14	14	7	10
16	.....	5	7	7	66	95	80	19	26	14	10	10
17	.....	5	7	10	54	95	80	14	95	14	10	10
18	.....	7	7	14	66	95	80	14	66	14	10	10
19	.....	5	10	19	66	80	66	19	34	14	10	10
20	.....	5	10	19	54	95	66	19	34	14	10	10
21	.....	5	10	19	43	95	54	19	34	14	14	5
22	.....	5	10	14	43	95	54	19	26	14	14	5
23	.....	5	10	14	80	95	54	14	26	14	14	5
24	.....	7	10	26	130	112	54	14	26	14	14	5
25	.....	5	10	34	130	95	43	14	26	14	14	5
26	.....	5	7	34	80	95	43	14	19	14	14	5
27	.....	5	7	43	95	95	43	14	19	14	14	5
28	.....	5	7	43	66	95	43	14	19	14	14	2
29	.....	.....	10	34	66	95	34	14	19	14	14	2
30	5	.....	10	34	130	80	34	14	19	14	14	2
31	5	.....	7	.....	168	.....	34	14	.....	14	.....	2

NOTE.—Daily discharge determined from a well-defined rating curve. Discharge estimated for the period during which ice was probably present, Dec. 7 to 31.

Monthly discharge of Pahsimeroi River near Goldburg, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
February	7	2.5	5.45	303	B.
March	10	5	7.7	474	A.
April	43	.7	15.9	946	A.
May	168	26	69.4	4,270	A.
June	228	54	95.4	5,680	A.
July	95	34	68.5	4,210	A.
August	34	14	18.6	1,140	A.
September	95	14	23.3	1,390	A.
October	19	14	14.6	898	A.
November	14	7	11.9	708	A.
December	14	2	8.6	529	C.
The period				20,500	

GOLDBURG CREEK NEAR GOLDBURG, IDAHO.

This station, which is located just above the Wells ditch near Goldburg post office, was established January 30, 1910.

Wells ditch diverts water from Pahsimeroi River into Goldburg Creek in order to pass it around the sinks in Pahsimeroi River.

A temporary gage was installed in January and replaced by a permanent gage on April 15. Records from the temporary gage have been referred to the permanent gage.

Discharge measurements have been made by wading.

The station was discontinued December 31, 1910.

Discharge measurements of Goldburg Creek near Goldburg, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 15	O. W. Hartwell	5.3	2.2	1.12	3.3
22	Thomas Latimer, jr	5.3	2.7	1.18	4.5
23	do	5.3	2.7	1.19	4.8
24	do	5.3	3.1	1.22	5.8
25	do	5.3	2.9	1.20	5.4
27	do	5.3	2.9	1.21	5.7
28	do	5.3	3.2	1.28	6.1
May 2	do	5.3	3.7	1.40	7.4
3	do	5.3	3.5	1.34	7.9
4	do	5.3	3.4	1.30	7.1
6	do	5.5	4.6	1.60	11.2
7	do	5.4	4.2	1.50	9.2
9	do	5.3	3.4	1.35	7.2
10	do	7.0	6.3	1.79	17.5
11	do	5.3	4.2	1.48	8.8
12	do	5.3	3.8	1.42	7.7
16	do	5.3	3.7	1.40	7.1
17	do	5.3	2.9	1.20	5.8
18	do	5.3	2.7	1.18	4.9
19	do	5.3	2.6	1.11	4.1
20	do	5.3	2.8	1.17	5.3
21	do	5.3	2.9	1.20	5.1
Sept. 30	H. L. Stoner	5.3	4.7	1.6	4.3

Daily gage height, in feet, of Goldburg Creek near Goldburg, Idaho, for 1910.

[Bates, Knight, and Long, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.0	1.2	1.3	1.4	1.5	1.7	1.7	1.7	1.6	1.6	1.6
2	.....	1.0	1.4	1.3	1.4	1.5	1.7	1.7	1.7	1.6	1.6	1.6
3	.....	1.0	2.3	1.4	1.4	1.5	1.7	1.7	1.7	1.6	1.6	1.6
4	.....	1.0	2.0	1.3	1.3	1.5	1.7	1.7	1.7	1.6	1.6	1.6
5	.....	1.0	1.4	1.2	1.7	1.6	1.7	1.7	1.7	1.6	1.6	1.6
6	.....	1.0	1.3	1.2	1.6	1.6	1.7	1.7	1.7	1.6	1.6	1.6
7	.....	1.0	1.3	1.3	1.5	1.6	1.7	1.7	1.7	1.6	1.6	1.6
8	.....	1.1	1.3	1.2	1.4	1.6	1.7	1.7	1.7	1.6	1.6	1.6
9	.....	1.0	1.3	1.2	1.5	1.6	1.7	1.7	1.7	1.6	1.6	1.6
10	.....	1.0	1.2	1.2	1.8	1.6	1.7	1.7	1.7	1.6	1.6	1.6
11	.....	1.0	1.4	1.3	1.5	1.7	1.7	1.7	1.7	1.6	1.6	1.6
12	.....	1.1	1.5	1.3	1.4	1.7	1.7	1.7	1.7	1.6	1.6	1.6
13	.....	1.1	1.5	1.2	1.4	1.7	1.7	1.7	1.7	1.6	1.6	1.6
14	.....	1.1	1.4	1.2	1.4	1.7	1.7	1.7	1.7	1.6	1.6	1.6
15	.....	1.1	1.3	1.2	1.4	1.7	1.7	1.7	1.7	1.6	1.6	1.6
16	.....	1.0	1.5	1.2	1.3	1.7	1.7	1.7	1.7	1.6	1.6	1.6
17	.....	1.0	1.5	1.2	1.3	1.6	1.7	1.7	1.7	1.6	1.6	1.6
18	.....	1.0	1.5	1.2	1.2	1.7	1.7	1.7	1.7	1.6	1.6	1.6
19	.....	1.0	1.8	1.2	1.1	1.7	1.7	1.7	1.7	1.6	1.6	1.6
20	.....	1.0	1.6	1.2	1.2	1.7	1.7	1.7	1.6	1.6	1.6	1.6
21	.....	1.0	1.5	1.2	1.2	1.7	1.7	1.7	1.6	1.6	1.6	1.6
22	.....	1.0	1.4	1.2	1.2	1.7	1.7	1.7	1.6	1.6	1.6	1.6
23	.....	1.0	1.3	1.2	1.2	1.6	1.7	1.7	1.6	1.6	1.6	1.6
24	.....	1.0	1.2	1.2	1.2	1.6	1.7	1.7	1.6	1.6	1.6	1.6
25	.....	1.1	1.3	1.2	1.3	1.6	1.7	1.7	1.6	1.6	1.6	1.6
26	.....	1.1	1.3	1.2	1.2	1.7	1.7	1.7	1.6	1.6	1.6	1.6
27	.....	1.1	1.2	1.2	1.3	1.7	1.7	1.7	1.6	1.6	1.6	1.6
28	.....	1.1	1.3	1.3	1.4	1.7	1.9	1.7	1.6	1.6	1.6	1.6
29	.....	.....	1.3	1.5	1.3	1.7	1.7	1.7	1.6	1.6	1.6	1.6
30	1.1	.....	1.2	1.4	1.3	1.7	1.7	1.7	1.6	1.6	1.6	1.6
31	1.0	.....	1.3	.....	1.5	.....	1.7	1.7	.....	1.6	.....	1.6

Daily discharge, in second-feet, of Goldburg Creek near Goldburg, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	.....	2.0	4.6	6.2	7.4	16	.....	2.0	10	4.6	7.1
2	.....	2.0	8.1	6.2	7.4	17	.....	2.0	10	4.6	5.8
3	.....	2.0	29	8.1	7.9	18	.....	2.0	10	4.6	4.9
4	.....	2.0	21	6.2	7.1	19	.....	2.0	16	4.6	4.1
5	.....	2.0	8.1	4.6	13.6	20	.....	2.0	12	4.6	5.3
6	.....	2.0	6.2	4.6	11.2	21	.....	2.0	10	4.6	5.1
7	.....	2.0	6.2	6.2	9.2	22	.....	2.0	8.1	4.5	5.1
8	.....	3.2	6.2	4.6	6.2	23	.....	2.0	6.2	4.8	5.1
9	.....	2.0	6.2	4.6	7.2	24	.....	2.0	4.6	5.8	5.1
10	.....	2.0	4.6	4.6	17.5	25	.....	3.2	6.2	5.4	5.1
11	.....	2.0	8.1	6.2	8.8	26	.....	3.2	6.2	5.6	5.1
12	.....	3.2	10	6.2	7.7	27	.....	3.2	4.6	5.7	5.1
13	.....	3.2	10	4.6	7.4	28	.....	3.2	6.2	6.1	5.1
14	.....	3.2	8.1	4.6	7.4	29	.....	.....	6.2	9.2	5.1
15	.....	3.2	6.2	4.6	7.4	30	.....	3.2	.....	4.6	7.4	5.1
						31	.....	2.0	.....	6.2	.....	5.1

NOTE.—Daily discharge Jan. 30 to Apr. 21 determined from a rating curve not well defined. Discharge Apr. 22 to May 31 estimated from discharge measurements. Insufficient data obtained for estimates of daily discharge June to December.

Monthly discharge of Goldburg Creek near Goldburg, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
February	3.2	2.0	2.38	132	C.
March	29	4.6	8.70	535	C.
April	9.2	4.5	5.47	325	C.
May	17.5	4.1	6.99	430	C.

BIG CREEK NEAR PATTERSON, IDAHO.

This station, which is located at the mouth of the canyon, at Carey's mine, on unsurveyed land, and near Patterson, Idaho, was established January 28, 1910.

No water is diverted above the station and no large tributaries enter below. The flow below the station is decreased by seepage. It is proposed to divert water from Big Creek near the station to a reservoir on Goldburg Creek.

The gage is a vertical staff. The gage datum has remained constant.

Discharge measurements are made from a gaging bridge.

Ice is present in the stream during the winter months and affects the relation between gage height and discharge.

Discharge measurements of Big Creek near Patterson, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 11	O. W. Hartwell	15	22	3.20	69
23	Thomas Latimer, jr	17	25	3.30	88
24	do	17	27	3.59	107
25	do	17	30	3.70	128
27	do	17	31	3.95	152
May 2	do	17	27	3.59	102
3	do	17	25	3.50	87
4	do	17	26	3.49	86
6	do	17	25	3.45	84
7	do	17	27	3.61	104
9	do	17	33	4.09	195
10	do	19	48	4.90	436
11	do	18	39	4.58	333
12	do	18	38	4.48	269
17	do	17	30	3.90	150
19	do	17	32	4.00	159
21	do	17	30	3.78	137
Oct. 1	H. L. Stoner	13	16	2.75	27

Daily gage height, in feet, of Big Creek near Patterson, Idaho, for 1910.

[Wilbur Nelson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.2	2.8	2.9	3.6	5.0	3.7	3.0	2.9	3.3	2.8	3.1
2	.....	3.0	2.7	2.9	3.6	4.8	3.8	2.9	3.0	3.0	2.8	3.1
3	.....	2.8	2.7	2.8	3.5	4.6	3.6	2.9	3.0	2.8	2.8	3.2
4	.....	2.4	2.7	2.9	3.5	4.4	3.5	2.9	3.0	2.8	2.8	3.2
5	.....	2.4	2.8	2.9	3.4	4.2	3.5	2.9	2.9	2.9	2.8	3.2
6	.....	2.6	2.8	2.9	3.4	4.0	3.7	2.8	2.9	2.9	2.8	3.2
7	.....	2.6	2.9	2.8	3.8	3.8	3.7	2.9	2.9	2.8	2.8	3.1
8	.....	2.6	2.9	2.8	4.0	4.0	3.6	2.9	2.9	2.8	2.9	3.2
9	.....	2.7	2.9	2.8	4.3	3.8	3.6	3.0	2.9	2.8	2.9	3.2
10	.....	2.7	2.9	3.0	5.1	3.8	3.5	3.0	2.9	2.9	2.9	3.2
11	.....	2.7	3.0	3.2	4.7	3.6	3.5	2.9	2.9	3.1	2.9	3.2
12	.....	2.8	3.0	3.3	4.6	3.8	3.5	2.9	2.9	3.2	2.9	3.2
13	.....	2.8	3.0	3.3	4.7	3.9	3.5	2.9	3.0	3.2	2.9	3.1
14	.....	2.8	2.8	3.2	4.5	4.0	3.4	2.9	3.0	3.1	2.9	3.1
15	.....	2.7	2.8	3.2	4.4	4.0	3.4	2.9	3.0	3.2	2.9	3.1
16	.....	2.7	2.8	3.3	4.1	3.9	3.4	2.9	3.1	3.2	2.9	3.1
17	.....	2.7	2.8	3.2	3.9	3.8	3.2	2.9	3.1	3.1	2.9	3.1
18	.....	2.7	2.9	3.2	4.0	3.7	3.1	2.8	3.1	3.0	2.9	3.1
19	.....	2.8	3.1	3.3	4.2	3.7	3.2	2.8	3.2	3.0	2.9	3.1
20	.....	2.8	3.3	3.3	4.1	3.7	3.2	2.8	3.2	2.9	2.9	3.0
21	.....	3.0	3.3	3.3	3.8	3.7	3.1	2.9	3.2	2.9	2.9	3.0
22	.....	2.9	3.35	3.3	4.2	3.6	3.1	2.9	3.2	2.9	3.0	3.0
23	.....	2.9	3.25	3.6	4.3	3.6	3.1	2.9	3.3	2.9	3.0	2.9
24	.....	2.9	3.1	3.65	4.6	3.6	3.1	2.8	3.3	2.9	3.1	2.9
25	.....	2.8	3.1	3.8	4.5	3.6	3.1	2.8	3.3	2.8	3.1	2.9
26	.....	2.9	3.1	4.0	4.2	3.6	3.2	2.8	3.3	2.8	3.1	2.9
27	.....	2.8	3.1	4.1	4.2	3.5	3.1	2.8	3.2	2.8	3.1	2.8
28	2.7	2.8	3.0	4.0	4.3	3.5	3.1	2.8	3.2	2.8	3.0	2.8
29	2.7	.....	3.0	3.8	4.1	3.5	3.1	2.8	3.3	2.8	3.0	2.8
30	2.8	.....	2.9	3.8	4.2	3.6	3.1	2.8	3.3	2.8	3.0	2.8
31	3.4	.....	2.9	.....	4.4	.....	3.0	2.9	.....	2.8	.....	.....

NOTE.—Ice present along the shores and in the stream during most of December.

Daily discharge, in second-feet, of Big Creek near Patterson, Idaho, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	58	30	35	104	464	118	42	35	68	30
2	.....	42	25	35	104	392	134	35	42	42	30
3	.....	30	25	30	90	326	104	35	42	30	30
4	.....	11	25	35	90	263	90	35	42	30	30
5	.....	11	30	35	78	210	90	35	35	35	30
6	.....	20	30	35	78	168	118	30	35	35	30
7	.....	20	35	30	134	134	118	35	35	30	30
8	.....	20	35	30	168	168	104	35	35	30	35
9	.....	25	35	30	235	134	104	42	35	30	35
10	.....	25	35	42	500	134	90	42	35	35	35
11	.....	25	42	58	358	104	90	35	35	50	35
12	.....	30	42	68	326	134	90	35	35	58	35
13	.....	30	42	68	358	150	90	35	42	58	35
14	.....	30	30	58	294	168	78	35	42	50	35
15	.....	25	30	58	263	168	78	35	42	58	35
16	.....	25	30	68	188	150	78	35	50	58	35
17	.....	25	30	58	150	134	58	35	50	50	35
18	.....	25	35	58	168	118	50	30	50	42	35
19	.....	30	50	68	210	118	58	30	58	42	35
20	.....	30	68	68	188	118	58	30	58	35	35
21	.....	42	68	68	134	118	50	35	58	35	35
22	.....	35	73	68	210	104	50	35	58	35	42
23	.....	35	63	104	235	104	50	35	68	35	42
24	.....	35	50	111	326	104	50	30	68	35	50
25	.....	30	50	134	294	104	50	30	68	30	50
26	.....	35	50	168	210	104	58	30	68	30	50
27	.....	30	50	188	210	90	50	30	58	30	50
28	25	30	42	168	235	90	50	30	58	30	42
29	25	.....	42	134	188	90	50	30	68	30	42
30	30	.....	35	134	210	104	50	30	68	30	42
31	78	.....	35	.....	263	.....	42	35	.....	30	.....

NOTE.—Daily discharge determined from a rating curve well defined above 80 second-feet and fairly well defined below.

Monthly discharge of Big Creek near Patterson, Idaho, for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
February	58	11	28.9	1,600	B.
March	73	25	40.7	2,500	B.
April	188	30	74.8	4,450	A.
May	500	78	213	13,100	A.
June	464	90	159	9,460	A.
July	134	42	75.7	4,650	A.
August	42	30	33.9	2,080	B.
September	68	35	49.1	2,920	B.
October	68	30	39.2	2,410	B.
November	50	30	37.0	2,200	B.
December			35.0	2,150	D.
The period				47,500	

NOTE.—Mean discharge for December estimated at 35 second-feet.

GRANDE RONDE RIVER BASIN.

GENERAL FEATURES.

Grande Ronde River drains the eastern slope of the Blue Mountains in Oregon and the northern slopes of the Powder River Mountains—a comparatively high range that runs at right angles to the Blue Mountain Range. The river rises on the divide in the extreme southern portion of Union County, flows in a northeasterly direction and empties into Snake River at Zindel, Wash., about 12 miles below the Oregon-Washington line. The principal tributaries of the Grande Ronde are Joseph Creek, which drains the northern portion of the Wallowa National Forest; the Wallowa, which rises in the Powder Mountains and drains the western part of the Wallowa National Forest; and Catherine Creek, which drains the western portion of the Powder Mountains. The drainage area of Grande Ronde River at its mouth is 3,950 square miles. Above the mouth of the Wallowa the drainage area is 1,590 square miles.

The topography of this basin is generally rough, the area being almost entirely surrounded by mountain ranges which slope gradually to Grande Ronde Valley, a large area of agricultural land approximately 2,700 feet above sea level. The general elevation of the Powder and Blue Mountains, from which the river receives its water supply, is 8,000 feet.

The drainage area of this river, except in the agricultural valleys, is almost entirely forested, a large part being included in the national forests. The mean annual rainfall at La Grande is 19 inches, but on the headwaters of the stream it is probably 35 inches. The greater part of this precipitation occurs during the winter months as snow. The river is subject to an annual spring rise, due to the melting of snow in the mountains, and damaging floods are frequently caused by the sudden melting of snows by chinook winds.

The agricultural activities have in the past been largely confined to the production of wheat and irrigation has not been extensively practiced, although exceptionally good opportunities are afforded. Only the lower valley lands immediately contiguous to the streams have been irrigated, but there are at present under consideration a number of larger projects that involve the construction of reservoirs and the irrigation of large areas by means of long canals. Records of the flow of some of the streams in this basin have been kept since 1904.

GRANDE RONDE RIVER AT HILGARD, OREG.

This station, which is located at the county highway bridge, one-half mile below Hilgard station on the Oregon-Washington Railroad & Navigation line, at the head of Grande Ronde Valley, and just below the mouth of Five Points Creek, which is one of the most important tributaries above the Grande Ronde Valley, was established November 6, 1903.

The river was formerly used extensively for the transportation of logs, and water was impounded behind a number of dams and released when needed to carry the logs to their destination. Many times logs ground on the bars below the station and produce backwater, even in the cross-section where measurements are made. These conditions have not prevailed to nearly so great an extent in 1910 as formerly, and the records are, therefore, better.

The vertical staff gage is fastened to the downstream side of the middle pier of the bridge from which discharge measurements are made. This gage was washed out by flood early in March, 1910, and was replaced in August at a new datum, bearing no determined relation to the old, as the bridge had in the meantime been removed and the bench mark destroyed.

The following discharge measurement was made by R. W. Davenport by wading:

August 30, 1910: Width, 32 feet; area, 15.8 square feet; gage height, 1.48 feet; discharge, 14.2 second-feet.

Daily gage height, in feet, of Grande Ronde River at Hilgard, Oreg., for 1910.

[Owen Scott, observer.]

Day.	Jan.	Feb.	Mar.	Oct.	Nov.	Dec.	Day.	Jan.	Feb.	Mar.	Oct.	Nov.	Dec.
1	3.0	4.4	5.5	1.5	1.6	2.0	16	3.0	3.8	.....	1.6	1.7	1.7
2	3.05	4.4	6.6	1.6	1.6	2.1	17	3.0	3.8	.....	1.7	1.7	1.8
3	3.0	4.4	6.6	1.6	1.6	2.2	18	3.0	3.8	.....	1.7	1.8	1.8
4	3.0	4.2	.....	1.6	1.6	2.6	19	3.0	3.8	.....	1.7	1.8	1.8
5	3.0	4.2	.....	1.8	1.6	2.7	20	3.0	3.8	.....	1.6	1.8	1.8
6	3.0	4.1	.....	1.8	1.6	2.6	21	3.0	3.8	.....	1.6	1.8	1.8
7	3.0	4.1	.....	1.7	1.6	2.4	22	3.1	3.8	.....	1.6	1.9	1.8
8	3.0	4.0	.....	1.6	1.7	2.2	23	3.1	3.8	.....	1.6	1.8	1.9
9	2.9	4.0	.....	1.6	1.8	2.0	24	4.0	3.8	.....	1.6	1.9	1.9
10	2.9	3.9	.....	1.6	1.9	1.9	25	4.1	3.8	.....	1.7	1.9	1.9
11	2.9	3.9	.....	1.6	2.0	1.8	26	4.3	3.8	.....	1.7	1.9	1.9
12	2.9	3.9	.....	1.6	2.0	1.7	27	4.7	4.1	.....	1.6	1.9	1.9
13	2.9	3.9	.....	1.6	1.9	1.7	28	4.4	4.3	.....	1.6	1.9	1.9
14	2.8	3.8	.....	1.6	1.9	1.7	29	4.2	.....	.....	1.6	2.0	1.9
15	2.9	3.9	.....	1.6	1.8	1.7	30	4.4	.....	.....	1.6	2.0	1.9
							31	4.4	.....	.....	1.5	.....	1.9

NOTE.—River frozen Jan. 1 to Feb. 28; average thickness of ice about 4 inches. Gage taken out by high water Mar. 4; old gage and bench mark were destroyed by construction work on the new bridge during the summer; datum of new gage, on which readings were begun Oct. 1, bears no determined relation to that of the old gage.

Daily discharge, in second-feet, of Grande Ronde River at Hilgard, Oreg., for 1910.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	16	26	105	11	26	105	58	21	26	58	58
2	26	26	135	12	26	105	40	22	26	80	58
3	26	26	167	13	26	80	40	23	26	58	80
4	26	26	340	14	26	80	40	24	26	80	80
5	58	26	392	15	26	58	40	25	40	80	80
6	58	26	340	16	26	40	40	26	40	80	80
7	40	26	247	17	40	40	58	27	26	80	80
8	26	40	167	18	40	58	58	28	26	80	80
9	26	58	105	19	40	58	58	29	26	105	80
10	26	80	80	20	26	58	58	30	26	105	80
								31	16	.....	80

NOTE.—Daily discharge October to December determined from a fairly well-defined discharge rating curve; discharge for January and February can not be computed because of ice.

Monthly discharge of Grande Ronde River at Hilgard, Oreg., for 1910.

[Drainage area, 660 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
October	40	16	30.1	0.045	0.05	1,850	B.
November	105	26	61.6	.093	.10	3,670	B.
December	392	40	110	.167	.19	6,760	B.

GRANDE RONDE RIVER AT ELGIN, OREG.

This station, which is located at the county highway bridge on the road from Elgin to Wallowa, Oreg., at the lower end of Grande Ronde Valley, within the city limits of Elgin, above the mouth of Clarks Creek and below the mouth of Indian Creek, was established November 20, 1903.

The chain gage is attached to the upstream side of the bridge. Its datum has remained practically unchanged.

The bed of the stream is exceedingly rough, and at high water the current is at a decided angle to the bridge.

Discharge measurements are made from the downstream side of the bridge or, during low stages, by wading.

The following discharge measurement was made by F. C. Ebert.

September 15, 1910: Width, 37 feet; area, 39 square feet; gage height, 1.22 feet; discharge, 24.8 second-feet. Made by wading 300 feet above the bridge,

Daily gage height, in feet, of Grande Ronde River at Elgin, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	2.45	4.78	5.1	4.5	2.8	1.5	1.2	1.2	1.4	1.5	2.0
2	2.0	2.25	6.0	5.1	4.3	2.75	1.5	1.2	1.2	1.45	1.5	2.05
3	2.7	2.5	9.95	5.0	4.2	2.75	1.4	1.2	1.2	1.45	1.5	2.2
4	2.5	2.35	6.4	5.0	4.2	2.6	1.4	1.2	1.2	1.45	1.5	2.5
5	2.6	2.25	6.5	4.9	4.25	2.6	1.4	1.2	1.2	1.45	1.5	2.5
6	2.55	2.25	6.4	4.75	4.25	2.5	1.4	1.2	1.2	1.4	1.5	2.8
7	2.5	2.2	6.0	4.75	4.1	2.45	1.4	1.2	1.2	1.4	1.5	2.75
8	2.55	2.2	5.7	4.9	3.9	2.4	1.4	1.2	1.2	1.4	1.6	2.6
9	2.45	2.2	5.4	5.05	4.0	2.3	1.4	1.2	1.2	1.4	1.65	2.5
10	2.35	2.2	5.3	5.3	4.35	2.2	1.3	1.2	1.2	1.35	1.75	2.45
11	2.15	2.2	.....	5.75	4.35	2.2	1.3	1.2	1.2	1.35	1.75	2.35
12	2.15	2.15	5.4	5.7	4.3	2.1	1.35	1.2	1.2	1.35	1.8	2.3
13	2.15	2.15	5.5	5.75	4.25	2.05	1.35	1.2	1.2	1.35	1.8	2.2
14	2.05	2.15	5.7	5.65	4.2	2.0	1.35	1.15	1.2	1.35	1.75	2.1
15	2.1	2.25	5.9	5.55	4.1	2.0	1.35	1.15	1.25	1.35	1.75	2.05
16	2.1	2.25	6.0	5.35	4.1	1.95	1.3	1.15	1.25	1.35	1.65	2.0
17	2.1	2.2	6.2	5.25	4.0	1.95	1.25	1.15	1.3	1.35	1.65	1.9
18	2.1	2.15	6.25	5.25	3.9	1.9	1.3	1.2	1.3	1.35	1.65	1.95
19	2.15	2.15	6.4	5.25	3.8	1.85	1.3	1.2	1.3	1.4	1.65	1.95
20	2.15	2.15	7.85	5.25	(a)	1.85	1.25	1.2	1.35	1.4	1.8	2.0
21	2.1	2.1	7.6	5.3	.....	1.85	1.3	1.15	1.35	1.45	1.9	1.95
22	2.1	2.1	8.1	5.3	.....	1.85	1.25	1.15	1.4	1.45	1.95	1.9
23	2.3	2.1	7.9	5.3	3.3	1.8	1.25	1.15	1.4	1.5	2.0	1.9
24	2.4	2.2	7.3	5.2	3.2	1.75	1.2	1.15	1.4	1.5	2.1	1.9
25	2.55	2.7	6.85	5.2	3.15	1.7	1.2	1.2	1.35	1.5	2.0	1.9
26	2.7	2.6	6.4	5.2	3.15	1.6	1.2	1.2	1.35	1.5	1.95	1.9
27	2.7	2.7	6.2	5.2	3.25	1.6	1.2	1.2	1.35	1.5	1.9	1.9
28	2.7	2.9	5.9	5.0	3.15	1.6	1.2	1.2	1.35	1.5	1.9	1.9
29	2.6	.....	5.6	4.9	3.1	1.5	1.2	1.2	1.35	1.5	1.95	1.9
30	2.6	.....	5.5	4.45	3.0	1.5	1.2	1.2	1.35	1.5	1.95	1.85
31	2.5	.....	5.25	.....	2.9	.....	1.2	1.2	.....	1.5	.....	1.8

a Absent.

NOTE.—River frozen Jan. 3 to 10; ice jams Jan. 23 to Feb. 15, which affected the reading of the gage.

Daily discharge, in second-feet, of Grande Ronde River at Elgin, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	185	240	3,280	3,820	2,750	575	52	23	23	39	52	185
2	185	240	5,440	3,820	2,410	545	52	23	23	46	52	202
3	192	240	5,350	3,640	2,250	545	39	23	23	46	52	260
4	199	250	6,160	3,640	2,250	455	39	23	23	46	52	400
5	206	250	6,340	3,460	2,330	455	39	23	23	46	52	400
6	212	250	6,160	3,190	2,330	400	39	23	23	39	52	575
7	219	260	5,440	3,190	2,090	375	39	23	23	39	52	545
8	225	260	4,900	3,460	1,780	350	39	23	23	39	68	455
9	232	260	4,360	3,730	1,930	305	39	23	23	39	80	400
10	240	260	4,180	4,180	2,500	260	30	23	23	34	106	375
11	240	250	4,270	4,990	2,500	260	30	23	23	34	106	328
12	240	250	4,360	4,900	2,410	220	34	23	23	34	120	305
13	240	250	4,540	4,990	2,330	202	34	23	23	34	120	260
14	202	240	4,900	4,810	2,250	185	34	20	23	34	106	220
15	220	240	5,260	4,630	2,090	185	34	20	26	34	106	202
16	220	282	5,440	4,270	2,170	167	30	20	26	34	80	185
17	220	260	5,800	4,090	1,930	167	26	20	30	34	80	150
18	220	240	5,890	4,090	1,780	150	30	23	30	34	80	167
19	240	240	6,160	4,090	1,630	135	30	23	30	39	80	167
20	240	240	8,770	4,090	1,480	135	26	23	34	39	120	185
21	220	220	8,320	4,180	1,210	135	30	20	34	46	150	167
22	220	220	9,220	4,180	1,090	135	26	20	39	46	167	150
23	220	220	8,860	4,180	980	120	26	20	39	52	185	150
24	220	260	7,780	4,000	880	106	23	20	39	52	220	150
25	220	515	6,970	4,000	835	92	23	23	34	52	185	150
26	230	455	6,160	4,000	835	68	23	23	34	52	167	150
27	230	515	5,800	4,000	930	68	23	23	34	52	150	150
28	230	640	5,260	3,640	835	68	23	23	34	52	150	150
29	230	.....	4,720	3,460	790	52	23	23	34	52	167	150
30	240	.....	4,540	2,660	710	52	23	23	34	52	167	135
31	240	.....	4,090	.....	640	.....	23	23	.....	52	.....	120

NOTE.—Daily discharge determined from a discharge rating curve fairly well defined between 20 and 4,000 second-feet. Discharge Jan. 3 to 10 and Jan. 23 to Feb. 15 interpolated because of ice.

Monthly discharge of Grande Ronde River at Elgin, Oreg., for 1910.

[Drainage area, 1,350 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	240	185	222	.164	0.19	13,600	C.
February	640	220	287	.213	.22	15,900	C.
March	9,220	3,280	5,770	4.27	4.92	355,000	B.
April	4,990	2,660	3,980	2.95	3.29	237,000	B.
May	2,750	640	1,710	1.27	1.46	105,000	B.
June	575	52	232	1.72	.19	13,800	B.
July	52	23	31.6	.023	.03	1,940	B.
August	23	20	22.2	.016	.02	1,360	B.
September	39	23	28.4	.021	.02	1,690	B.
October	52	34	42.7	.031	.04	2,630	B.
November	220	52	111	.082	.09	6,600	B.
December	575	120	245	.181	.21	15,100	B.
The year	9,220	20	1,060	.785	10.68	770,000	

GRANDE RONDE RIVER AT ZINDEL, WASH.

This station, which is located at Zindel Ferry, 2 miles above the mouth of the stream, 1½ miles below Joseph Creek, was established June 30, 1904.

An inclined staff is located on the left bank just below the ferry. Discharge measurements are made from the ferryboat.

The datum of the gage has not been changed since it was installed The gage-height records are complete, but owing to the inaccessibility of the station few measurements have been made. The conditions at the station are favorable for the construction of a permanent rating curve.

The following measurement was made by R. W. Davenport from a boat:

August 25, 1910: Width, 196 feet; area, 802 square feet; gage height, 1.97 feet; discharge, 542 second-feet.

Daily gage heights, in feet, of Grande Ronde River at Zindel, Wash., for 1910.

[M. W. Zindel, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	2.4	5.45	6.1	5.3	4.9	2.9	2.1	1.95	2.1	2.2	3.2
2	2.1	2.4	8.9	6.5	5.3	4.8	2.9	2.0	1.95	2.1	2.2	3.2
3	2.1	2.4	10.4	6.5	5.3	4.5	2.9	2.0	1.95	2.2	2.2	4.0
4	2.0	2.3	9.95	6.6	5.2	4.5	2.9	2.0	1.95	2.2	2.2	4.0
5	2.0	2.3	8.4	6.4	5.1	4.9	2.8	2.0	1.95	2.9	2.2	3.8
6	2.0	2.2	7.65	6.4	5.0	4.9	2.8	2.0	2.0	2.8	2.5	4.1
7	2.0	2.2	6.9	6.3	5.1	4.7	2.7	2.0	2.0	2.6	3.0	4.0
8	2.0	2.4	6.6	6.2	5.3	4.6	2.7	2.0	2.0	2.4	3.2	3.8
9	2.0	2.4	6.1	6.2	5.6	4.3	2.7	2.0	2.1	2.4	3.2	3.8
10	2.0	2.5	6.1	6.4	6.6	4.1	2.7	2.0	2.1	2.3	3.1	3.6
11	2.0	2.5	6.7	6.6	6.8	4.0	2.6	2.0	2.1	2.3	3.1	3.4
12	2.0	2.6	6.8	7.65	6.4	3.9	2.6	2.0	2.1	2.3	3.1	3.4
13	2.0	2.7	7.1	8.0	6.1	3.9	2.5	2.0	2.1	2.2	3.2	3.4
14	1.8	2.8	7.4	7.6	5.9	3.9	2.5	2.0	2.0	2.2	3.2	3.4
15	1.8	2.8	7.4	7.1	5.5	3.8	2.5	2.0	2.0	2.2	3.2	3.4
16	1.7	2.8	7.4	6.9	5.5	3.8	2.5	2.0	2.0	2.2	3.2	3.4
17	1.7	2.7	7.4	6.5	5.4	3.7	2.5	2.0	2.0	2.2	3.5	3.4
18	1.7	2.6	8.1	6.5	5.4	3.5	2.5	2.0	2.0	2.3	3.5	3.2
19	1.7	2.6	9.5	6.4	5.4	3.5	2.4	2.0	2.0	2.3	3.6	3.1
20	1.7	2.8	9.95	6.2	5.4	3.4	2.4	2.0	2.1	2.3	3.6	3.0
21	1.7	2.8	10.5	6.0	5.3	3.4	2.4	2.0	2.4	2.3	3.8	3.0
22	1.8	2.8	10.0	6.0	5.3	3.4	2.4	1.95	2.2	2.4	4.0	3.0
23	2.0	2.9	9.4	5.8	5.3	3.4	2.4	1.95	2.2	2.4	4.0	2.9
24	2.2	2.9	8.8	.....	5.1	3.3	2.4	1.95	2.2	2.4	4.0	2.9
25	2.3	2.9	7.9	5.7	5.1	3.3	2.3	1.95	2.2	2.3	3.6	2.9
26	2.3	3.15	7.2	5.5	5.0	3.3	2.3	1.95	2.2	2.3	3.4	2.9
27	2.3	3.55	6.8	5.5	4.8	3.3	2.2	1.95	2.2	2.2	3.4	2.9
28	2.3	3.9	6.6	5.3	4.7	3.3	2.2	1.95	2.2	2.2	3.1	2.8
29	2.5	.....	6.6	5.3	4.7	3.0	2.2	1.95	2.2	2.2	3.2	2.9
30	2.5	.....	6.4	5.3	4.7	2.9	2.2	1.95	2.1	2.2	3.2	2.9
31	2.5	.....	6.1	.....	4.9	.....	2.2	1.95	.....	2.2	.....	2.9

NOTE.—Floating and shore ice existed at times during January and February, and the gage readings were doubtless somewhat affected at times, but the open-channel rating curve will probably give results not far from the true value.

WALLOWA RIVER NEAR JOSEPH, OREG.

This station, which is located about 300 feet below the controlling dam at the outlet of Wallowa Lake and about 1½ miles above Joseph, Oreg., was established November 12, 1903.

Four large irrigation ditches divert a large portion of the normal flow of the river below the gage, the headgate for the first diversion being about 125 feet below the gage. The timber dam at the outlet of Wallowa Lake is jointly owned and operated by the managers of the irrigation ditches.

The original staff gage was located on Wallowa Lake near its outlet, but when the timber regulating dam was constructed it was moved July 12, 1905, to a point on the right bank of the river 500 feet downstream and 50 feet above a footbridge, from which the discharge measurements are made. From March 31 to July 12, 1905, readings were taken on a temporary gage about 100 feet below the dam and reduced to the datum of the new staff gage set July 12, 1905. The gage heights are subject to regulation by the dam above.

The bed of the river is composed of coarse gravel and bowlders and is very rough. Individual discharge measurements can not be made with great accuracy, except by taking unusual precautions, but a rating curve averaging all the measurements gives fair results.

Discharge measurements of Wallowa River near Joseph, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 13[a]	F. C. Ebert	29	31.1	2.02	63.9
Sept. 13[a]	R. H. Bolster	29	30	2.01	62.6

[a] Measurement made by wading.

Daily gage height, in feet, of Wallowa River near Joseph, Oreg., for 1910.

[John Martin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.2	2.0	2.0	2.3	2.6	3.1	3.0	2.6	2.1	2.0	2.1	2.3
2	2.1	2.0	2.0	2.3	2.6	3.1	3.0	2.6	2.1	2.0	2.1	2.3
3	2.1	2.0	2.0	2.3	2.6	3.2	2.8	2.5	2.1	2.0	2.1	2.3
4	2.1	2.0	2.0	2.3	2.6	3.2	2.8	2.4	2.1	2.0	2.1	2.3
5	2.1	2.0	2.0	2.3	2.6	3.1	2.8	2.4	2.1	2.0	2.1	2.3
6	2.1	2.0	2.0	2.3	2.6	3.1	2.8	2.4	2.1	2.0	2.2	2.3
7	2.1	2.0	2.0	2.3	2.6	3.1	2.5	2.4	2.1	2.0	2.2	2.3
8	2.1	2.0	2.0	2.3	2.7	3.1	2.5	2.4	2.1	2.0	2.2	2.3
9	2.1	2.0	2.0	2.3	2.7	3.1	2.5	2.4	2.1	2.1	2.2	2.3
10	2.0	2.0	2.0	2.4	2.7	3.1	2.6	2.3	2.1	2.1	2.2	2.3
11	2.0	2.0	2.0	2.4	2.7	3.1	2.6	2.3	2.0	2.1	2.2	2.3
12	2.0	2.0	2.0	2.4	2.8	3.1	2.6	2.3	2.0	2.1	2.2	2.3
13	2.0	2.0	2.1	2.4	2.8	3.1	2.8	2.3	2.0	2.1	2.2	2.3
14	2.0	2.0	2.1	2.4	2.8	3.1	2.8	2.3	2.0	2.1	2.2	2.3
15	2.0	2.0	2.1	2.4	2.9	3.1	2.9	2.3	2.0	2.1	2.2	2.3
16	2.0	2.0	2.1	2.4	2.9	3.1	2.9	2.3	2.0	2.1	2.2	2.3
17	2.0	2.0	2.1	2.4	2.9	3.1	2.9	2.3	2.0	2.1	2.2	2.3
18	2.0	2.0	2.1	2.4	2.9	3.1	2.8	2.3	2.0	2.1	2.2	2.3
19	2.0	2.0	2.1	2.4	2.9	3.0	2.8	2.3	2.0	2.1	2.2	2.3
20	2.0	2.0	2.2	2.4	3.0	3.0	2.8	2.3	2.0	2.1	2.2	2.3
21	2.0	2.0	2.2	2.4	3.0	3.0	2.8	2.2	2.0	2.1	2.2	2.3
22	2.0	2.0	2.2	2.5	3.0	3.0	2.8	2.2	2.0	2.1	2.2	2.3
23	2.0	2.0	2.2	2.5	3.0	3.0	2.8	2.2	2.0	2.1	2.2	2.3
24	2.0	2.0	2.2	2.5	3.0	3.0	2.8	2.2	2.0	2.1	2.2	2.3
25	2.0	2.0	2.2	2.5	3.0	3.0	2.8	2.2	2.0	2.1	2.2	2.3
26	2.0	2.0	2.2	2.6	3.0	3.0	2.7	2.2	2.0	2.1	2.2	2.3
27	2.0	2.0	2.3	2.6	3.0	3.0	2.7	2.2	2.0	2.1	2.3	2.3
28	2.0	2.0	2.3	2.6	3.0	3.0	2.7	2.2	2.0	2.1	2.3	2.3
29	2.0	.....	2.3	2.6	3.0	3.0	2.6	2.2	2.0	2.1	2.3	2.3
30	2.0	.....	2.3	2.6	3.0	3.0	2.6	2.2	2.0	2.1	2.3	2.3
31	2.0	.....	2.3	.....	3.0	.....	2.6	2.2	.....	2.1	.....	2.3

NOTE.—River does not freeze at this point, as it is just below Wallowa Lake.

Daily discharge, in second-feet, of Wallowa River near Joseph, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	105	60	60	135	240	495	435	240	80	60	80	135
2	80	60	60	135	240	495	435	240	80	60	80	135
3	80	60	60	135	240	560	325	200	80	60	80	135
4	80	60	60	135	240	560	325	165	80	60	80	135
5	80	60	60	135	240	495	325	165	80	60	80	135
6	80	60	60	135	240	495	325	165	80	60	105	135
7	80	60	60	135	240	495	200	165	80	60	105	135
8	80	60	60	135	280	495	200	165	80	60	105	135
9	80	60	60	135	280	495	200	165	80	80	105	135
10	60	60	60	165	280	495	240	135	80	80	105	135
11	60	60	60	165	280	495	240	135	60	80	105	135
12	60	60	60	165	325	495	240	135	60	80	105	135
13	60	60	80	165	325	495	325	135	60	80	105	135
14	60	60	80	165	325	495	325	135	60	80	105	135
15	60	60	80	165	375	495	375	135	60	80	105	135
16	60	60	80	165	375	495	375	135	60	80	105	135
17	60	60	80	165	375	495	375	135	60	80	105	135
18	60	60	80	165	375	495	325	135	60	80	105	135
19	60	60	80	165	375	435	325	135	60	80	105	135
20	60	60	105	165	435	435	325	135	60	80	105	135
21	60	60	105	165	435	435	325	105	60	80	105	135
22	60	60	105	200	435	435	325	105	60	80	105	135
23	60	60	105	200	435	435	325	105	60	80	105	135
24	60	60	105	200	435	435	325	105	60	80	105	135
25	60	60	105	200	435	435	325	105	60	80	105	135
26	60	60	105	240	435	435	280	105	60	80	105	135
27	60	60	135	240	435	435	280	105	60	80	135	135
28	60	60	135	240	435	435	280	105	60	80	135	135
29	60	.....	135	240	435	435	240	105	60	80	135	135
30	60	.....	135	240	435	435	240	105	60	80	135	135
31	60	.....	135	.....	435	.....	240	105	.....	80	.....	135

NOTE.—Daily discharge determined from a rating curve fairly well defined between 60 and 150 second-feet and fairly well defined to 500 second-feet.

Monthly discharge of Wallowa River near Joseph, Oreg., for 1910.

[Drainage area, 47 square miles.]

Month.	Discharge in second-feet.				Run-off		Accuracy.
	Maximum.	Minimum.	Mean.	Mean per square mile.	Depth in inches.	Total in acre-feet.	
January	105	60	66.6	1.42	1.64	4,100	B.
February	60	60	60.0	1.28	1.33	3,330	B.
March	135	60	86.8	1.85	2.13	5,340	B.
April	240	135	173	3.68	4.11	10,300	B.
May	435	240	351	7.47	8.61	21,600	B.
June	560	435	475	10.1	11.27	28,300	B.
July	435	200	304	6.47	7.46	18,700	B.
August	240	105	139	2.96	3.41	8,550	B.
September	80	60	66.7	1.42	1.58	3,970	B.
October	80	60	74.8	1.59	1.83	4,600	B.
November	135	80	105	2.23	2.49	6,250	B.
December	135	135	135	2.87	3.31	8,300	B.
Year	560	60	170	3.62	49.17	123,000	

WALLOWA RIVER AT MINAM, OREG.[1]

This station, which is located in Wallowa Canyon, about 9 miles below the lower end of Wallowa Valley, just below the mouth of Minam River and 12 miles from Elgin, Oreg., near Minam station, on the extension of the Elgin branch of the Oregon-Washington Railroad & Navigation Co.'s line, was established November 18, 1903.

The gage is in two sections on the left bank at the site of the old bridge which collapsed during October, 1905. Discharge measurements were formerly made here, but from this date until August, 1906, they were made from a temporary bridge 900 feet upstream. The new steel highway bridge, from which measurements are now made, is about 1,000 feet upstream from the gage. The location and datum of the gage have remained unchanged.

During the winter months ice affects the results to a considerable degree. Occasionally ice gorges form below the station which back the water above the gage. The flow of the stream is fairly uniform.

The following discharge measurement was made by F. C. Ebert:

September 14, 1910: Width, 137 feet; area, 216 square feet; gage height, 2.32 feet; discharge, 317 second-feet.

Daily gage heights, in feet, of Wallowa River at Minam, Oreg., for 1910.

[A. M. Boswell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.7	2.8	4.8	3.7	4.25	4.9	3.2	2.4	2.35	2.4	2.5	2.9
2	2.7	2.8	5.7	3.7	4.1	4.85	3.2	2.4	2.35	2.45	2.55	2.9
3	2.7	2.8	5.1	3.8	4.25	4.6	3.15	2.4	2.3	2.5	2.55	2.9
4	2.7	2.8	4.7	3.7	4.2	4.2	3.1	2.4	2.3	2.8	2.55	3.3
5	2.8	2.75	4.6	3.7	4.0	4.1	3.05	2.4	2.3	2.6	2.5	3.1
6	.....	2.75	4.1	3.85	3.95	4.2	3.0	2.4	2.3	2.5	2.5	3.0
7	.....	2.8	3.9	3.9	4.05	4.0	2.95	2.4	2.3	2.5	2.5	2.9
8	.....	2.8	3.8	4.0	4.3	3.8	2.9	2.4	2.3	2.5	2.7	3.0
9	.....	2.8	3.8	4.25	4.6	3.9	2.9	2.4	2.3	2.5	2.8	3.0
10	.....	2.8	3.8	4.45	5.2	3.7	2.85	2.35	2.3	2.5	2.7	2.9
11	.....	2.8	3.75	4.75	5.1	3.95	2.85	2.35	2.35	2.5	2.9	2.8
12	.....	2.8	3.9	4.8	4.8	4.1	2.8	2.35	2.35	2.5	3.0	2.8
13	.....	2.8	3.95	4.6	4.9	3.7	2.8	2.3	2.35	2.5	2.9	2.8
14	.....	2.85	4.1	4.4	4.85	3.7	2.75	2.3	2.35	2.5	2.9	2.8
15	.....	2.85	4.2	4.2	4.55	3.7	2.7	2.3	2.35	2.5	2.7	2.8
16	.....	2.8	4.2	4.1	4.55	3.8	2.75	2.35	2.4	2.5	2.7	2.8
17	.....	2.85	4.25	4.1	4.5	3.7	2.7	2.3	2.7	2.5	2.7	2.7
18	.....	2.8	4.35	4.2	4.45	3.6	2.7	2.3	2.5	2.5	2.7	2.7
19	.....	2.8	4.5	4.5	4.6	3.5	2.7	2.3	2.45	2.6	2.65	2.65
20	.....	2.8	4.7	4.85	4.4	3.4	2.65	2.3	2.4	2.6	2.65	2.7
21	.....	2.8	5.3	4.65	4.35	3.4	2.65	2.3	2.4	2.6	2.8	2.75
22	.....	2.85	5.0	4.5	4.4	3.4	2.55	2.3	2.7	2.6	3.3	2.6
23	2.7	2.85	5.2	4.6	4.6	3.4	2.65	2.3	2.5	2.5	3.35	2.6
24	2.8	2.85	4.7	4.8	4.6	3.35	2.65	2.3	2.45	2.5	3.1	2.65
25	2.8	2.85	4.4	5.1	4.8	3.3	2.6	2.3	2.4	2.5	3.1	2.6
26	2.8	2.85	4.2	5.3	4.5	3.3	2.5	2.3	2.4	2.5	3.0	2.55
27	2.7	2.85	4.05	5.0	4.5	3.3	2.5	2.3	2.4	2.5	2.9	2.6
28	2.7	3.0	3.9	4.9	4.2	3.3	2.5	2.3	2.4	2.5	2.9	2.6
29	2.7	.....	3.75	4.6	4.2	3.25	2.5	2.3	2.4	2.5	2.85	2.6
30	2.8	.....	3.6	4.4	4.4	3.25	2.5	2.3	2.4	2.5	2.8	2.65
31	2.8	.....	3.9	.....	4.5	.....	2.45	2.3	.....	2.5	.....	2.5

NOTE.—River full of floating ice Jan. 6 to 24; channel full of slush ice and river frozen along banks Feb. 6 to 12 and Feb. 20 to Mar. 3.

[1] This station has been referred to in former reports as "Wallowa River near Elgin."

Daily discharge, in second-feet, of Wallowa River at Minam, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	564	652	3,700	1,760	2,640	3,900	1,080	352	324	352	415	748
2	564	652	5,570	1,760	2,380	3,800	1,080	352	324	384	450	748
3	564	652	4,310	1,900	2,640	3,300	1,020	352	295	415	450	748
4	564	652	3,500	1,760	2,560	2,560	964	352	295	652	450	1,210
5	652	608	3,300	1,760	2,220	2,380	908	352	295	485	415	964
6	564	608	2,380	1,980	2,140	2,560	852	352	295	415	415	852
7	564	652	2,060	2,060	2,300	2,220	800	352	295	415	415	748
8	564	652	1,900	2,220	2,730	1,900	748	352	295	415	564	852
9	564	652	1,900	2,640	3,300	2,060	748	352	295	415	652	852
10	564	652	1,900	3,000	4,520	1,760	700	324	295	415	564	748
11	564	652	1,830	3,600	4,310	2,140	700	324	324	415	748	652
12	564	652	2,060	3,700	3,700	2,380	652	324	324	415	852	652
13	564	652	2,140	3,300	3,900	1,760	652	295	324	415	748	652
14	564	700	2,380	2,910	3,800	1,760	608	295	324	415	748	652
15	564	700	2,560	2,560	3,200	1,760	564	295	324	415	564	652
16	564	652	2,560	2,380	3,200	1,900	608	324	352	415	564	652
17	564	700	2,640	2,380	3,100	1,760	564	295	564	415	564	564
18	564	652	2,820	2,560	3,000	1,610	564	295	415	415	564	564
19	564	652	3,100	3,100	3,300	1,470	564	295	384	485	524	524
20	564	652	3,500	3,800	2,910	1,340	524	295	352	485	524	564
21	564	652	4,730	3,400	2,820	1,340	524	295	352	485	652	608
22	564	700	4,100	3,100	2,910	1,340	450	295	564	485	1,210	485
23	564	700	4,520	3,300	3,300	1,340	524	295	415	415	1,270	485
24	652	700	3,500	3,700	3,300	1,270	524	295	384	415	964	524
25	652	700	2,910	4,310	3,700	1,210	485	295	352	415	964	485
26	652	700	2,560	4,730	3,100	1,210	415	295	352	415	852	450
27	564	700	2,300	4,100	3,100	1,210	415	295	352	415	748	485
28	564	852	2,060	3,900	2,560	1,210	415	295	352	415	748	485
29	564	.....	1,830	3,300	2,560	1,140	415	295	352	415	700	485
30	652	.....	1,610	2,910	2,910	1,140	415	295	352	415	652	524
31	652	.....	2,060	.....	3,100	.....	384	295	.....	415	.....	415

NOTE.—Daily discharge determined from a discharge rating curve well defined between 300 and 2,500 second-feet. Discharge Jan. 6 to 22 estimated. Determinations for January and February probably too high, as relation between gage heights and discharge may have been affected by ice, which has not been allowed for.

Monthly discharge of Wallowa River at Minam, Oreg., for 1910.

[Drainage area, 870 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	652	564	581	0.668	0.77	35,700	C.
February	852	608	671	.771	.80	37,300	B.
March	5,570	1,610	2,850	3.28	3.78	175,000	B.
April	4,730	1,760	2,930	3.37	3.76	174,000	B.
May	4,520	2,140	3,070	3.53	4.07	189,000	B.
June	3,900	1,140	1,890	2.17	2.42	112,000	A.
July	1,080	384	641	.737	.85	39,400	A.
August	352	295	315	.362	.42	19,400	A.
September	564	295	351	.403	.45	20,900	A.
October	652	352	431	.495	.57	26,500	A.
November	1,270	415	665	.764	.85	39,600	A.
December	1,210	415	646	.743	.86	39,700	A.
The year	5,570	295	1,260	1.45	19.60	908,000	

CLEARWATER RIVER BASIN.

GENERAL FEATURES.

Clearwater River rises on the western slope of the Bitterroot Mountains opposite the head of Bitterroot River, and discharges into Snake River at Lewiston, at the point where Snake River enters the State of Washington.

The drainage area comprises 9,650 square miles, is very rugged, and is rather heavily forested, a large part of the timber being cedar. The lower part of the basin contains much fine agricultural land. A narrow strip of bottom land along the river is irrigated to some extent by water from small tributaries. Practically no water is diverted from the main stream. From the valley the hills rise abruptly to a table-land, 2,000 to 3,000 feet in general elevation, which comprises the fertile wheat lands of eastern Oregon and Washington.

LOCHSA FORK OF CLEARWATER RIVER NEAR LOWELL, IDAHO.

This station, which is located about 1½ miles above Lowell post office at the Pete King ranger station in the Clearwater National Forest, in sec. 33, T. 33 N., R. 7 E. Boise meridian (unsurveyed), about 25 miles above Kooskia, Idaho, on the Northern Pacific Railway, the nearest railway point, was established November 8, 1910, and is maintained in cooperation with the United States Forest Service.

The station is below all tributaries to the Lochsa. The drainage area above the station comprises 1,170 square miles and is heavily forested with cedar.

The channel is composed of heavy gravel and bowlders and is probably permanent.

Discharge measurements are made from a car on the Forest Service ferry cable at Lowell.

Relation between gage heights and discharge may be somewhat affected by ice during the winter months.

Conditions favor the accurate determination of discharge.

The following discharge measurement was made by Ebert and Kramer:

November 8, 1910: Width, 297 feet; area, 1,120 square feet; gage height, 3.36 feet; discharge, 2,980 second-feet.

Daily gage height, in feet, of Lochsa Fork of Clearwater River near Lowell, Idaho, for 1910.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1			11	3.97		21	3.14	2.30
2			12	3.82		22	3.72	2.30
3		2.83	13	3.44		23	3.45	2.30
4			14	3.23		24	3.20	
5			15	3.05		25	3.06	
6			16	2.85		26	2.90	
7			17	2.75		27		
8	3.36		18	2.82	2.42	28		2.20
9	3.18		19	2.75	2.22	29		2.18
10	3.45		20	2.69	2.15	30		2.17
						31		2.16

CLEARWATER RIVER AT KAMIAH, IDAHO.

This station, which is located at the toll bridge at Kamiah, Idaho, in sec. 1, T. 33 N., R. 3 E. Boise meridian, about 6 miles below the mouth of the South Fork, was established August 21, 1910.

The drainage area comprises 4,850 square miles.

The gage is painted on the steel bridge caisson.

The bed of the stream is composed of gravel, is rather rough, and may shift slightly during floods at stages between gage heights 5 and 8 feet.

Discharge measurements are made from the lower side of the toll bridge.

Discharge measurements of Clearwater River at Kamiah, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 20	Allen and Davenport		511	2.28	1,160
Nov. 6	F. C. Ebert	250	810	3.48	2,850

Daily gage height, in feet, of Clearwater River at Kamiah, Idaho, for 1910.

[G. W. McGuire, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1		2.75	2.5	3.55	4.2	16		2.5	3.45	4.85	3.4
2		3.00	2.9	3.75	4.25	17		2.7	3.35	4.35	3.65
3		2.80	3.05	3.85	4.35	18		2.9	3.85	4.6	3.9
4		2.5	5.25	3.85	5.05	19		2.8	4.25	4.7	3.8
5		2.5	4.75	3.7	5.0	20	2.30	2.7	3.8	4.6	3.5
6		2.5	3.9	3.5	4.8	21	2.30	2.95	3.65	5.0	3.4
7		2.5	3.8	3.65	4.4	22	2.20	3.0	3.45	5.95	3.7
8		2.5	3.95	4.7	4.65	23	2.20	3.1	3.35	5.55	3.7
9		2.45	3.8	5.1	4.3	24	2.20	2.85	3.25	5.4	3.65
10		2.45	3.7	4.65	4.2	25	2.20		3.2	5.1	3.5
11		2.45	3.55	6.0	4.0	26	2.20	2.5	3.7	4.65	3.6
12		2.4	3.25	6.25	4.1	27	2.25	2.5	3.95	4.4	3.8
13		2.35	3.2	5.8	3.95	28	2.25	2.5	3.55	4.2	3.8
14		2.3	3.9	5.4	3.8	29	2.40	2.45	3.4	4.5	3.5
15		2.3	3.75	4.95	3.55	30	2.80	2.45	3.2	4.4	3.4
						31	2.55		3.3		3.5

CLEARWATER RIVER NEAR LEWISTON, IDAHO.

This station, which is located at central ferry, about 3 miles above Lewiston and 4 miles above the mouth of the river, below all important tributaries and diversions, was established August 23, 1910.

The drainage area above the station is 9,640 square miles.

The gage is a vertical staff attached to posts driven in the river bed on the right bank near the ferry.

The bed of the stream is even, is composed of heavy gravel, and is probably nearly permanent, but it may shift slightly during extreme floods. The current is straight.

Discharge measurements are made from a car on the upper ferry cable.

Conditions favor accurate determination of discharge.

Discharge measurements of Clearwater River near Lewiston, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 22	Allen and Davenport	425	1,170	1.00	2,300
Nov. 4	F. C. Ebert	472	2,010	2.90	6,200

Daily gage height, in feet, of Clearwater River near Lewiston, Idaho, for 1910.

[Virgil Hirtzler, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	1.1	2.3	3.5	16	.....	1.1	2.3	4.1	2.8
2	.....	1.5	1.2	2.5	3.5	17	.....	1.2	2.2	3.8	2.8
3	.....	1.9	2.2	2.5	3.5	18	.....	1.4	2.1	3.6	3.0
4	.....	1.7	3.0	2.8	4.0	19	.....	1.6	3.1	3.6	3.0
5	.....	1.6	4.0	2.7	5.1	20	.....	1.5	2.9	3.5	2.8
6	.....	1.5	3.0	2.5	4.5	21	.....	1.4	2.5	3.8	2.4
7	.....	1.4	2.7	2.5	4.1	22	.....	1.65	2.3	7.3	2.6
8	.....	1.3	2.65	3.0	4.0	23	1.0	1.85	2.1	6.0	2.8
9	.....	1.3	2.6	5.1	3.9	24	.9	1.9	2.05	5.5	2.8
10	.....	1.2	2.5	4.3	3.8	25	.9	1.5	2.0	4.9	3.0
11	.....	1.2	2.4	5.4	3.6	26	1.0	1.3	2.1	4.6	2.9
12	.....	1.1	2.2	6.7	3.4	27	1.1	1.2	2.65	4.0	2.8
13	.....	1.1	2.1	5.8	3.4	28	1.1	1.2	2.7	3.8	2.7
14	.....	1.1	2.05	5.0	3.3	29	1.1	1.1	2.3	3.8	2.6
15	.....	1.1	2.5	4.5	3.3	30	1.1	1.1	2.2	3.7	2.6
						31	1.5	.....	2.2	.....	2.6

SOUTH FORK OF CLEARWATER RIVER NEAR GRANGEVILLE, IDAHO.

This station, which is located below the power station about 10 miles southeast of Grangeville, in the SE. ¼ NE. ¼ sec. 30, T. 30 N., R. 4 E. Boise meridian, about 25 miles above the mouth of the river, was established November 14, 1910, and is maintained in cooperation with the United States Forest Service.

The inflow between this station and the station at Kooskia is relatively small at low water and the two records should be nearly comparable.

The drainage area above the station is 940 square miles.

The gage is located below both the old and new power stations on the river and the records show the total amount of water passing these stations, which are operated under a special permit from the Forest Service.

Discharge measurements are made from a cable and car.

The accuracy of the record may be affected somewhat by the artificial control of the water at the power plant.

The following discharge measurement was made by F. C. Ebert:

Nov. 14, 1910: Area, 228 square feet; gage height, 1.25 feet; discharge, 360 second-feet.

Daily gage height, in feet, of South Fork of Clearwater River near Grangeville, Idaho, for 1910.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1		1.2	11		1.15	21	1.45	1.1
2		1.25	12		1.1	22	1.95	1.05
3		1.2	13		1.0	23	1.6	1.1
4		1.6	14	1.25	.9	24	1.5	1.05
5		1.4	15	1.15	.9	25	1.4	1.25
6		1.2	16	1.25	1.3	26	1.2	.95
7		1.3	17	1.2	1.2	27	.95	1.0
8		1.2	18	1.15	1.05	28	1.2	1.0
9		1.25	19	1.15	1.0	29	1.3	.95
10		.95	20	1.15	1.0	30	1.25	.95
						31		.95

SOUTH FORK OF CLEARWATER RIVER AT KOOSKIA, IDAHO.

This station, which is located at the highway bridge at Kooskia about one-half mile above the mouth of the stream, in sec. 5, T. 32 N., R. 4 E. Boise meridian, was established October 2, 1910, in cooperation with the United States Forest Service.

The drainage area above the station comprises 1,270 square miles.

The gage is a vertical staff fastened to the right abutment of the bridge.

The bed of the river is composed of gravelly bars which are liable to shift, and the water runs in two channels at all except high stages.

Discharge measurements are made from the downstream side of the highway bridge.

Discharge measurements of South Fork of Clearwater River at Kooskia, Idaho, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 19	R. W. Davenport	95	118	1.14	151
Nov. 10	Ebert and Kramer			1.62	470

Daily gage height, in feet, of South Fork of Clearwater River at Kooskia, Idaho, for 1910.

[U. S. Forest Service, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	1.6	1.6	11	1.3	1.9	1.6	21	1.6	1.7	1.4
2	1.45	1.6	1.6	12	1.3	1.9	1.5	22	1.5	1.9	1.4
3	1.5	1.7	1.7	13	1.3	1.75	1.5	23	1.35	1.8	1.4
4	1.6	1.6	1.65	14	1.35	1.7	1.4	24	1.45	1.7	1.3
5	1.6	1.6	1.7	15	1.3	1.6	1.4	25	1.5	1.7	.....
6	1.5	1.5	1.6	16	1.3	1.5	1.4	26	1.6	1.7	.....
7	1.4	1.4	1.5	17	1.3	1.5	1.4	27	1.45	1.6	.....
8	1.4	1.7	1.4	18	1.5	1.4	1.4	28	1.5	1.7	.....
9	1.4	1.85	1.6	19	1.8	1.5	1.4	29	1.4	1.7	.....
10	1.3	1.85	1.5	20	1.7	1.6	1.4	30	1.4	1.6	1.3
								31	1.6	.....	1.3

PALOUSE RIVER BASIN.

GENERAL FEATURES.

Palouse River rises in the northern part of Latah County, Idaho, on the divide between the Spokane and Snake River drainage basins, flows west and then south, and discharges into Snake River in the southwest corner of Whitman County, Wash. The drainage area comprises 2,310 square miles, and at Winona measures 1,120 square miles.

The surface is in general rolling and in some places is rough and broken. The average elevation at the headwaters of the stream is 3,000 feet above sea level; the elevation at Colfax is 1,974 feet.

The principal tributary of Palouse River is Rock Creek, which drains a number of small lakes in the northern part of Whitman County, Wash. The agricultural lands consist chiefly of rolling table-lands, which are largely utilized for the production of wheat. No forests of magnitude are found on the drainage area, and such as do exist are of the small black pines near the headwaters of the stream.

The mean annual rainfall is about 20 inches, much of which falls during the winter months in the form of snow.

The area is well adapted to irrigation, though the present development in that direction is restricted to the small areas contiguous to the streams where irrigation by individual or small company ditches is possible. A number of projects have been contemplated, involving the storage of waters from the main stream and its tributaries in some of the storage sites which are found in this area. These sites are in the form of long canyons, called coulees, usually dry. Dams constructed at favorable points in such coulees will develop storage reservoirs of considerable capacity, but unfortunately the water must be supplied by artificial channels, as the drainage area above them is usually insufficient to insure an adequate water supply. The soil of the country is well adapted to all kinds of products possible through irrigated agriculture.

PALOUSE RIVER AT HOOPER, WASH.

This station, which was originally established April 1, 1897, by the land department of the Northern Pacific Railway, was taken over by the United States Geological Survey September 9, 1897, and reestablished about 1 mile downstream and above the mouth of Cow Creek. It is 1 mile from Hooper, Wash., a station on the Oregon-Washington Railroad & Navigation Co.'s line.

The data obtained at this point are of value as indicating the amount of water available for irrigation on the lands of the Washtucna Valley and the territory to the north of Pasco. As the low-water flow is comparatively small, any development for irrigation must involve the construction of storage reservoirs. A number of sites were under consideration when the Palouse project was investigated by the United States Reclamation Service.

Several gages have been used, all referred to the same datum. The present gage is in two sections—an inclined low-water staff and a vertical staff on the right bank at the cable from which discharge measurements are made. The gage datum has remained unchanged. It is 1,053.42 feet above sea level.

The conditions at the station are favorable for good results. During the winter months there is little or no interference from ice, so that continuous records have been possible when gage observers were available.

The following discharge measurement was made by Ebert and Storey by wading.

November 1, 1910: Width, 76 feet; area, 84 square feet; gage height, 1.12 feet; discharge, 44.1 second-feet.

Daily gage height, in feet, of Palouse River at Hooper, Wash., for 1910.

[Mrs. L. C. Huffman, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.2	8.5	16.4	4.5	3.2	2.0	1.35	0.9	0.85	1.05	1.1	1.9
2	2.65	6.4	21.0	4.3	3.15	1.95	1.35	.9	.85	1.0	1.1	1.85
3	1.85	6.4	19.0	5.0	2.95	1.9	1.15	.8	.85	1.0	1.1	2.15
4	1.75	6.2	15.1	5.9	2.9	1.9	1.25	.8	.75	1.0	1.1	2.0
5	1.75	4.5	13.25	7.35	3.0	1.7	1.2	.85	.8	1.0	1.1	2.1
6	1.75	4.6	10.3	6.35	2.85	1.9	1.2	.9	.8	1.0	1.1	2.3
7	1.75	4.25	9.8	6.05	2.7	1.65	1.2	.95	.75	1.0	1.1	2.4
8	1.95	4.05	8.9	6.0	2.7	1.85	1.15	1.95	.8	.9	1.1	2.65
9	2.0	4.05	8.8	7.0	2.7	1.65	1.2	2.0	.8	.9	1.1	2.6
10	1.95	3.9	8.4	7.3	2.8	1.6	1.2	.6	.8	1.0	1.3	2.6
11	1.9	3.85	8.0	7.5	3.0	1.65	1.2	.8	.8	1.0	1.4	2.5
12	1.95	4.2	7.8	7.6	3.0	1.65	1.2	.9	.75	1.0	1.45	2.5
13	1.95	4.25	7.8	7.2	2.75	1.65	1.2	.95	.75	1.05	1.45	2.45
14	1.9	8.6	8.0	6.7	3.0	1.65	2.25	.85	.75	1.1	1.5	2.45
15	1.9	6.2	8.1	5.9	2.9	1.65	1.1	.85	.75	1.05	1.6	2.4

Daily gage height, in feet, of Palouse River at Hooper, Wash., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	1.95	5.4	8.0	5.5	2.7	1.65	0.9	0.8	0.75	1.05	1.6	2.1
17	1.95	4.8	8.0	4.9	2.65	1.6	.9	.85	.8	1.1	1.65	2.05
18	1.95	4.6	8.0	4.7	2.4	1.55	.9	.8	.8	1.1	1.7	2.0
19	2.4	4.2	7.9	4.5	2.3	1.5	.95	.8	.8	1.0	1.65	2.0
20	3.0	4.1	7.9	4.45	2.2	1.55	1.0	.8	.8	1.1	1.6	2.0
21	2.6	3.95	8.8	4.4	2.2	1.5	1.05	.75	.8	1.1	1.65	2.0
22	5.25	3.2	10.0	4.5	2.1	1.5	1.05	.8	.85	1.05	1.75	2.0
23	7.0	3.5	9.0	4.4	2.1	1.5	1.05	.85	.85	1.0	2.0	2.0
24	11.5	3.3	8.9	4.0	2.2	1.45	1.1	.85	.95	1.05	2.75	2.1
25	8.0	3.5	8.5	3.7	2.1	.25	1.05	.85	.95	1.05	2.55	2.4
26	7.0	3.6	7.8	4.0	2.0	1.15	1.0	.85	.9	1.1	2.5	2.55
27	6.4	8.0	6.9	3.7	2.2	1.55	.65	.85	.95	1.1	2.3	2.3
28	6.2	14.0	6.5	3.65	2.1	1.5	.65	.85	.95	1.1	2.15	2.3
29	7.1	.....	6.3	3.45	2.0	1.45	.75	.85	1.0	1.1	2.0	2.3
30	6.8	.....	5.25	3.4	2.2	1.45	.9	.85	1.1	1.05	1.9	2.2
31	6.2	.....	4.7	.....	2.1	.....	.9	.85	.....	1.1	.....	2.15

NOTE.—No ice reported at this station. The extreme variations during the summer are caused by the manipulation of water for irrigation.

Daily discharge, in second-feet, of Palouse River at Hooper, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	233	4,560	18,600	1,080	510	186	72	25	22	38	42	165
2	350	2,470	27,800	960	495	176	72	25	22	33	42	155
3	155	2,470	23,800	1,380	435	165	48	18	22	33	42	221
4	136	2,290	16,000	2,040	420	165	59	18	16	33	42	186
5	136	1,080	12,300	3,380	450	126	53	22	18	33	42	209
6	136	1,140	6,980	2,420	406	165	53	25	18	33	42	258
7	136	940	6,200	2,160	363	117	53	29	16	33	42	284
8	176	840	5,030	2,120	363	155	48	176	18	25	42	350
9	186	840	4,910	3,030	363	117	53	186	18	25	42	336
10	176	770	4,450	3,330	391	108	53	9	18	33	65	336
11	165	750	4,030	3,530	450	117	53	18	18	33	78	310
12	176	915	3,830	3,630	450	117	53	25	16	33	85	310
13	176	940	3,830	3,230	377	117	53	29	16	38	85	297
14	165	4,670	4,030	2,740	450	117	236	22	16	42	92	297
15	165	2,290	4,130	2,040	420	117	42	22	16	38	188	284
16	176	1,650	4,030	1,720	363	117	25	18	16	38	108	209
17	176	1,260	4,030	1,320	350	108	25	22	18	42	117	198
18	176	1,140	4,030	1,200	284	100	25	18	18	42	126	186
19	284	915	3,930	1,080	258	92	29	18	18	33	117	186
20	450	865	3,930	1,050	233	100	33	18	18	42	108	186
21	336	792	4,910	1,020	233	92	38	16	18	42	117	186
22	1,540	510	6,500	1,080	209	92	38	18	22	38	136	186
23	3,030	610	5,150	1,020	209	92	38	22	22	33	186	186
24	9,000	540	5,030	815	233	85	42	22	29	38	377	209
25	4,030	610	4,560	690	209	0	38	22	29	38	323	284
26	3,030	650	3,830	815	186	48	33	22	25	42	310	310
27	2,470	4,030	2,940	690	233	100	11	22	29	42	258	271
28	2,290	13,800	2,560	670	209	92	11	22	29	42	221	258
29	3,130	.....	2,380	592	186	85	16	22	33	42	186	258
30	2,840	.....	1,540	575	233	85	25	22	42	38	165	233
31	2,290	.....	1,200	.....	209	.....	25	22	.....	42	.....	221

NOTE.—Daily discharge determined from a fairly well defined rating curve. The high-water part of the curve coincides with that used for 1906 to 1908 and is somewhat larger than the curve used for 1909. It is somewhat uncertain just which curve should be used.

Monthly discharge of Palouse River at Hooper, Wash., for 1910.

[Drainage area, 2,210 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	8,650	118	1,130	0.511	0.59	69,500	B
February	13,300	430	1,800	.814	.85	100,000	B.
March	27,800	1,200	6,660	3.010	3.47	409,000	B.
April	3,630	575	1,710	.774	.86	102,000	B.
May	510	186	328	.148	.17	20,200	B.
June	186	0	112	.051	.06	6,660	B.
July	236	11	46.9	.021	.02	2,880	B.
August	186	9	31.5	.014	.02	1,940	B.
September	42	16	21.2	.010	.01	1,260	B.
October	42	25	36.7	.017	.02	2,260	B.
November	377	42	125	.057	.06	7,440	B.
December	350	155	244	.110	.13	15,000	B.
The year	27,800	0	1,020	4.61	6.26	738,000	

WALLA WALLA RIVER BASIN.

GENERAL FEATURES.

Walla Walla River rises on the western slope of the Blue Mountains, in the southwest portion of Walla Walla County, Wash., and the northeastern part of Umatilla County, Oreg., and flows westward into Columbia River. Its drainage area lies immediately north of that of Umatilla River and is in many respects similar.

Altitudes within the basin range from 5,000 feet on the headwaters to 1,000 feet near Walla Walla, and the mean annual rainfall ranges from 30 inches in the upper portion to 12 in the lower portion of the area. Only the upper part of the drainage area is forested; the lower half is given to the production of wheat without irrigation, but the lands contiguous to the streams are extensively irrigated.

Climate and soil combine to make the country wonderfully productive, and the agricultural products range from the hardier forage crops to fancy fruits.

The headwaters of the stream afford many water-power and storage sites which, if developed, would more than double the value of this stream. Many times the low-water flow of the river is appropriated for irrigation, and the only solution to a situation that has been aggravated in the extreme and promises to become even more critical as additional areas are irrigated lies in the construction of storage reservoirs.

The stream is fed by springs, and the flow is well maintained. The river throughout is swift, and the bed is composed of gravel that shifts with every freshet. On this account the records are incom-

plete and usually cover the period between floods. Floods on this stream are caused suddenly by chinook winds that melt the snows on the headwaters. Some of these floods have been exceedingly harmful, rendering large areas of fine farm lands worthless and causing great damage to life and property.

SOUTH FORK OF WALLA WALLA RIVER NEAR MILTON, OREG.

This station was originally established February 15, 1903, 1 mile above the mouth of the river and 7 miles from Milton, Oreg.

The flood of May 30, 1906, changed the channel of the river and left the gage high and dry. On August 10 a new station was established one-fourth mile above the head gate of the Northwest Gas & Electric Co.'s pipe line, in the canyon, 12 miles from Milton. It is above all diversions for irrigation.

The conditions at this station are not permanent, and a new rating curve is required after each large flood. Since the station was established one gage has been washed away and the records interrupted from March 14, 1908, to October 14, 1908, when a new gage was installed at the same point and datum as the old. Individual measurements can be made with accuracy at low stages. For low-water stages the records obtained prior to August 10, 1906, are not comparable with those obtained afterwards, because much of the water is largely diverted for irrigation in small ditches before reaching the lower station. A considerable portion of this water is undoubtedly returned to the stream, and there are also some contributions from intermediate drainage areas.

Daily and monthly estimates of discharge are withheld until more data have been obtained.

The following discharge measurement was made by R. W. Davenport:

August 27, 1910: Width, 34 feet; area, 40 square feet; gage height, 2.57 feet; discharge, 102 second-feet.

Daily gage height, in feet, of South Fork of Walla Walla River near Milton, Oreg., for 1910.

[John Munson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.8	2.8	3.6	3.2	3.1	2.8	2.6	2.6	2.6	2.6	2.6	2.8
2	2.7	2.8	4.3	3.2	3.1	2.8	2.6	2.6	2.6	2.6	2.6	2.8
3	2.7	2.8	3.95	3.2	3.1	2.8	2.6	2.6	2.6	2.85	2.6	2.9
4	2.7	2.8	3.7	3.1	3.2	2.8	2.6	2.6	2.6	2.7	2.6	3.1
5	2.7	2.8	3.7	3.15	3.2	2.8	2.6	2.6	2.6	2.6	2.6	3.0
6	2.7	2.8	3.5	3.3	3.2	2.8	2.6	2.6	2.6	2.6	2.6	3.0
7	2.7	2.8	3.3	3.3	3.2	2.7	2.6	2.6	2.6	2.6	2.6	3.0
8	2.7	2.8	3.2	3.3	3.2	2.7	2.6	2.6	2.6	2.6	2.8	2.9
9	2.7	2.8	3.1	3.35	3.2	2.7	2.6	2.6	2.6	2.6	2.7	2.9
10	2.7	2.8	3.1	3.5	3.4	3.7	2.6	2.6	2.6	2.6	2.7	2.9
11	2.7	2.8	3.15	3.6	3.35	2.7	2.6	2.6	2.6	2.6	2.9	2.8
12	2.7	2.8	3.3	3.6	3.2	2.7	2.6	2.6	2.6	2.6	2.8	2.8
13	2.7	2.8	3.45	3.5	3.2	2.7	2.6	2.6	2.6	2.6	2.7	2.8
14	2.7	2.8	3.5	3.4	3.1	2.7	2.6	2.6	2.6	2.6	2.7	2.8
15	2.7	2.8	3.5	3.3	3.1	2.7	2.6	2.6	2.6	2.6	2.7	2.8
16	2.7	2.8	3.55	3.2	3.1	2.75	2.6	2.6	2.65	2.6	2.7	2.8
17	2.7	2.8	3.65	3.35	3.1	2.75	2.6	2.6	2.6	2.65	2.7	2.7
18	2.7	2.8	3.7	3.45	3.1	2.7	2.6	2.6	2.6	2.6	2.7	2.7
19	2.7	2.8	3.75	3.65	3.1	2.7	2.6	2.6	2.6	2.6	2.7	2.7
20	2.7	2.8	4.45	3.75	3.0	2.7	2.6	2.6	2.6	2.6	2.75	2.7
21	2.7	2.8	3.95	3.45	2.9	2.7	2.6	2.6	2.6	2.6	3.2	2.7
22	2.75	2.8	3.9	3.45	2.9	2.7	2.6	2.6	2.6	2.6	3.05	2.7
23	3.05	2.8	3.85	3.6	2.9	2.7	2.6	2.6	2.6	2.6	3.2	2.7
24	3.3	3.05	3.6	3.65	2.8	2.7	2.6	2.6	2.6	2.6	3.0	2.7
25	3.1	3.1	3.4	3.5	2.9	2.6	2.6	2.6	2.6	2.6	2.9	2.7
26	2.8	3.0	3.4	3.4	2.9	2.6	2.6	2.6	2.6	2.6	2.8	2.7
27	2.8	3.0	3.3	3.3	2.9	2.6	2.6	2.6	2.6	2.6	2.8	2.7
28	2.8	3.15	3.2	3.3	2.9	2.6	2.6	2.6	2.6	2.6	2.8	2.7
29	2.9	.....	3.1	3.2	2.8	2.6	2.6	2.6	2.6	2.6	2.8	2.7
30	2.8	.....	3.1	3.2	2.8	2.6	2.6	2.6	2.6	2.6	2.8	2.7
31	2.8	.....	3.1	.....	2.8	.....	2.6	2.6	.....	2.6	.....	2.7

NOTE.—No ice forms at this station, as the water comes from large springs.

UMATILLA RIVER BASIN.

GENERAL FEATURES.

Umatilla River rises in the northeast corner of Umatilla County, Oreg., flows generally westward a distance of 80 miles, and empties into Columbia River at the town of Umatilla, Oreg. The drainage area above Pendleton spreads out in fan shape, including the western slope of the Blue Mountains for a distance of about 70 miles.

The principal tributaries are Birch, McKay, and Meacham creeks. The drainage area measures 2,130 square miles at the mouth of the river, 640 square miles at Pendleton, and 353 square miles at Gibbon.

The mean annual rainfall ranges from about 30 inches on the summit of the Blue Mountains to 9 inches at the mouth of the stream, being 14 inches at Pendleton and 25 inches at Weston, on the divide between Umatilla and Walla Walla rivers. The headwater regions of the stream are heavily forested, but downstream the forests give place to rolling table-lands devoted to wheat growing. The immediate valley of the river has been irrigated for many years, and the

entire low-water flow of the stream has been appropriated for irrigation. The United States Reclamation Service has completed a project to irrigate about 20,000 acres near Hermiston. The soil of this part of the drainage basin is sandy and the climatic conditions are favorable for the production of fruit.

The bed of the river throughout its course is composed of coarse gravel, which shifts during the sudden and violent floods, changing conditions materially. The river has developed a flood plain from 100 to 500 feet in width.

UMATILLA RIVER AT GIBBON, OREG.

This station, which is located on the Umatilla Indian Reservation, 1 mile below Gibbon, Oreg., about 1½ miles below the mouth of Meacham Creek, and 2 miles above the mouth of Squaw Creek, was established July 22, 1896.

Records of flow have been kept since 1896, but they have been interrupted by destruction of the equipment by floods or through the lack of an observer. These records are of particular value to irrigation projects in the lower valley and to water-power development.

Violent floods have already destroyed several gages and cables. After each flood the conditions are so altered that it is necessary to rerate the station. The maintenance of a permanent gage datum is therefore not essential. Owing to the shifting nature of the bed at high water, crest discharges can not be determined. Estimates during flood periods have, however, been made either from facts obtained from local authorities or by comparison with the other stations farther downstream whenever it could be done with a reasonable degree of accuracy.

Discharge measurements of Umatilla River at Gibbon, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 13	L. R. Allen	114	346.0	3.54	2,470.0
Aug. 31[a]	R. W. Davenport	40	49.3	.10	50.3
Sept. 11[a]	F. C. Ebert	46	40.4	.12	53.0
Sept. 11[a]	R. H. Bolster	51	42.2	.11	51.6

[a] Measured by wading.

Daily gage height, in feet, of Umatilla River at Gibbon, Oreg., for 1910.

[Walter Swart, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.45	1.25	3.5	2.2	1.6	0.7	0.25	0.1	0.1	0.15	0.2	1.45
2	.45	1.15	4.2	2.2	1.5	.65	.25	.1	.1	.15	.2	1.45
3	.45	1.1	4.0	2.15	1.45	.65	.25	.1	.1	.35	.2	1.7
4	.4	1.0	3.9	2.1	1.55	.6	.25	.1	.1	.3	.2	2.65
5	.4	.95	3.8	2.05	1.55	.55	.2	.1	.1	.2	.2	2.0
6	.4	.85	3.3	2.2	1.5	.55	.2	.1	.1	.2	.2	1.75
7	.4	.8	2.8	2.3	1.5	.55	.2	.1	.1	.2	.2	1.65
8	.35	.75	2.65	2.5	1.5	.5	.2	.1	.1	.2	.3	1.55
9	.35	.75	2.65	3.1	1.8	.45	.2	.1	.1	.2	.5	1.65
10	.35	.7	2.7	3.1	1.8	.45	.15	.1	.1	.2	.5	1.6
11	.3	.7	2.8	3.05	1.75	.45	.15	.1	.1	.2	.8	1.5
12	.3	.7	2.9	3.05	1.65	.4	.15	.1	.1	.2	.8	1.45
13	.3	.7	3.4	2.95	1.5	.4	.15	.1	.1	.2	.75	1.3
14	.3	.7	3.45	2.55	1.45	.4	.15	.1	.1	.2	.65	1.2
15	.3	.7	3.5	2.35	1.45	.4	.15	.1	.15	.2	.6	1.05
16	.3	.7	3.6	2.25	1.35	.4	.15	.1	.15	.2	.55	.95
17	.3	.7	3.7	2.3	1.25	.4	.15	.1	.15	.2	.55	.9
18	.25	.75	3.7	2.4	1.2	.4	.15	.1	.15	.2	.5	.9
19	.25	.75	3.8	2.5	1.15	.35	.15	.1	.15	.2	.45	.9
20	.3	.75	5.0	2.7	1.1	.35	.15	.1	.15	.2	.6	.9
21	1.4	.75	4.5	2.5	1.1	.35	.15	.1	.15	.2	1.2	.85
22	1.3	.75	4.4	2.25	1.05	.35	.15	.1	.15	.2	2.0	.85
23	1.75	.75	3.85	2.2	1.0	.35	.15	.1	.15	.2	2.4	.85
24	2.6	1.1	3.6	2.2	.9	.3	.15	.1	.15	.2	1.9	.85
25	2.2	1.1	3.0	2.15	.85	.3	.15	.1	.15	.2	1.6	.85
26	1.75	1.2	2.7	2.1	.8	.3	.1	.1	.15	.2	1.45	.85
27	1.5	1.3	2.6	1.95	.8	.3	.1	.1	.15	.2	1.3	.85
28	1.4	1.45	2.5	1.85	.75	.3	.1	.1	.15	.2	1.2	.9
29	1.35	.....	2.4	1.75	.75	.25	.1	.1	.15	.2	1.2	.9
30	1.3	.....	2.35	1.7	.75	.25	.1	.1	.15	.2	1.3	.9
31	1.3	.....	2.25	.....	.7	.....	.1	.1	.....	.2	.....	.9

NOTE.—Seldom any ice at this station.

Daily discharge, in second-feet, of Umatilla River at Gibbon, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	135	480	2,900	1,340	720	220	82	50	50	60	70	610
2	135	425	3,940	1,340	645	202	82	50	50	60	70	610
3	135	400	3,640	1,280	610	202	82	50	50	108	70	800
4	120	350	3,490	1,220	682	185	82	50	50	96	70	1,850
5	120	325	3,340	1,160	682	168	70	50	50	70	70	1,100
6	120	280	2,630	1,340	645	168	70	50	50	70	70	848
7	120	260	2,020	1,450	645	168	70	50	50	70	70	760
8	108	240	1,850	1,680	645	150	70	50	50	70	95	682
9	108	240	1,850	2,380	895	135	70	50	50	70	150	760
10	108	220	1,910	2,380	895	135	60	50	50	70	150	720
11	95	220	2,020	2,320	848	135	60	50	50	70	260	645
12	95	220	2,140	2,320	760	120	60	50	50	70	260	610
13	95	220	2,760	2,200	645	120	60	50	50	70	240	510
14	95	220	2,830	1,740	610	120	60	50	50	70	202	450
15	95	220	2,900	1,510	610	120	60	50	60	70	185	375
16	95	220	3,040	1,390	542	120	60	50	60	70	168	325
17	95	220	3,190	1,450	480	120	60	50	60	70	168	300
18	82	240	3,190	1,560	450	120	60	50	60	70	150	300
19	82	240	3,340	1,680	425	108	60	50	60	70	135	300
20	95	240	5,270	1,910	400	108	60	50	60	70	185	300
21	575	240	4,420	1,680	400	108	60	50	60	70	450	280
22	510	240	4,260	1,390	375	108	60	50	60	70	1,100	280
23	848	240	3,420	1,340	350	108	60	50	60	70	1,560	280
24	1,800	400	3,040	1,340	300	95	60	50	60	70	995	280
25	1,340	400	2,260	1,280	280	95	60	50	60	70	720	280
26	848	450	1,910	1,220	260	95	50	50	60	70	610	280
27	645	510	1,800	1,050	260	95	50	50	60	70	510	280
28	575	610	1,680	945	240	95	50	50	60	70	450	300
29	542	.....	1,560	848	240	82	50	50	60	70	450	300
30	510	.....	1,510	800	240	82	50	50	60	70	510	300
31	510	.....	1,390	.....	220	.....	50	50	.....	70	.....	300

NOTE.—Daily discharge determined from a rating curve well defined below 1,600 second-feet but somewhat uncertain above.

Monthly discharge of Umatilla River at Gibbon, Oreg., for 1910.

[Drainage area, 353 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	1,800	82	350	0.992	1.14	21,500	B.
February	610	220	306	.867	.90	17,000	B.
March	5,270	1,390	2,760	7.82	9.02	170,000	B.
April	2,380	860	1,520	4.31	4.81	90,400	B.
May	895	220	516	1.46	1.68	31,700	A.
June	220	82	130	.368	.41	7,740	A.
July	82	50	62.5	.177	.20	3,840	A.
August	50	50	50.0	.142	.16	3,070	A.
September	60	50	55.3	.157	.18	3,290	A.
October	108	60	104	.295	.34	6,400	A.
November	1,560	70	340	.963	1.07	20,200	A.
December	1,850	280	517	1.46	1.68	31,800	A.
The year	5,270	50	561	1.59	21.59	407,000	

UMATILLA RIVER NEAR YOAKUM, OREG.

This station, which is located at the Yoakum highway bridge, 1½ miles east of the Yoakum station of the Oregon-Washington Railroad & Navigation Co. and 18 miles below Pendleton, Oreg., was established May 5, 1903.

No tributaries enter in the immediate vicinity of the station, but water is diverted for irrigation by a number of ditches both above and below, the most important being the Horseshoe ditch, which takes water about 1 mile above the gaging site. A number of large canals take water from the river at points farther down, the largest of these being a supply canal for Cold Springs reservoir, which has recently been constructed by the United States Reclamation Service for the Umatilla project.

The gage is spiked to the south abutment of the highway bridge from which discharge measurements are made. The gage datum has not been changed since the station was established.

Conditions are favorable for good results at all stages except extreme high water, when the banks of the stream in the vicinity of the station are overflowed and the entire flood plain is covered.

Discharge measurements of Umatilla River near Yoakum, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 31	R. W. Davenport	53	21.9	2.99	28.1
Sept. 10	F. C. Ebert	52	23	3.02	26.9

NOTE.—Measurements made by wading below gage.

Daily gage height, in feet, of Umatilla River near Yoakum, Oreg., for 1910.

[John Doherty, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.98	5.55	7.60	6.05	4.80	3.68	3.12	2.90	3.00	3.10	3.25	4.72
2	3.92	5.30	9.20	6.15	4.68	3.65	3.10	2.85	3.00	3.15	3.25	4.92
3	3.90	5.20	9.20	6.12	4.60	3.62	3.10	2.90	3.02	3.25	3.25	4.98
4	3.90	5.22	8.60	5.92	4.72	3.60	3.10	2.75	3.00	3.20	3.25	5.22
5	3.90	5.10	8.80	5.82	4.78	3.58	3.10	2.82	3.00	3.32	3.30	5.62
6	3.90	4.92	8.05	6.15	4.78	3.50	3.05	2.85	3.00	3.30	3.30	5.70
7	.....	4.82	7.45	6.48	4.70	3.50	3.05	2.85	3.00	3.25	3.25	5.68
8	3.90	4.75	7.10	6.40	4.68	3.48	3.08	2.85	3.00	3.25	3.38	5.60
9	3.90	4.70	7.02	6.78	4.65	3.48	3.02	2.85	3.00	3.22	3.52	5.52
10	3.90	4.62	7.22	7.05	4.70	3.42	3.00	2.85	3.00	3.20	3.58	5.45
11	.....	4.60	7.30	7.22	5.15	3.38	3.00	2.85	3.00	3.20	3.65	5.38
12	.....	4.50	7.55	7.22	5.15	3.28	3.00	2.85	3.00	3.20	3.72	5.28
13	.....	4.52	7.75	7.05	5.05	3.25	3.00	2.85	3.00	3.20	3.82	5.12
14	.....	4.65	8.02	6.70	4.92	3.25	3.00	2.90	3.05	3.20	3.75	4.95
15	3.90	4.90	8.08	6.35	4.78	3.22	2.95	2.90	3.05	3.20	3.70	4.72
16	3.80	4.82	8.00	6.15	4.68	3.25	2.95	2.90	3.05	3.20	3.65	4.52
17	3.80	4.80	8.12	6.02	4.58	3.35	2.92	2.90	3.10	3.20	3.60	4.45
18	4.10	4.70	8.18	6.02	4.48	3.38	2.90	2.90	3.10	3.22	3.60	4.40
19	5.30	4.68	8.15	6.22	4.38	3.35	2.90	2.90	3.10	3.25	3.60	4.30
20	4.08	4.60	9.10	6.38	4.30	3.35	2.90	2.90	3.15	3.25	3.60	4.25
21	4.28	4.60	8.85	6.18	4.20	3.35	2.90	2.90	3.10	3.25	3.70	4.18
22	5.25	4.55	8.20	5.95	4.12	3.32	2.90	2.90	3.12	3.25	4.70	4.15
23	5.50	4.50	8.75	5.78	4.08	3.28	2.90	2.90	3.15	3.25	4.90	4.10
24	7.05	5.00	8.20	5.80	4.00	3.25	2.90	2.90	3.18	3.22	5.18	4.10
25	7.02	6.55	7.55	5.80	3.98	3.22	2.90	2.90	3.15	3.20	5.20	4.10
26	6.60	6.22	7.10	5.70	3.95	3.20	2.90	2.90	3.12	3.20	5.08	4.15
27	5.82	6.22	6.75	5.45	3.95	3.20	2.90	2.90	3.15	3.25	4.98	4.20
28	5.70	6.90	6.45	5.25	3.95	3.18	2.90	2.92	3.12	3.25	4.82	4.20
29	5.60	.....	6.25	5.05	3.90	3.15	2.90	2.92	3.10	3.25	4.70	4.20
30	5.42	.....	6.00	4.90	3.82	3.12	2.90	2.95	3.10	3.25	4.68	4.25
31	5.40	.....	5.92	.....	3.78	.....	2.90	3.00	.....	3.25	.....	4.25

NOTE.—River frozen Jan. 3 to 17; thickness of ice, 7½ inches; gage read to the top of the ice.

Daily discharge, in second-feet, of Umatilla River near Yoakum, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	253	1,220	3,580	1,420	562	130	38	20	27	36	54	522
2	232	1,020	6,260	1,500	502	124	36	17	27	42	54	625
3	202	940	5,790	1,480	462	117	36	20	29	54	54	659
4	202	956	5,100	1,310	522	112	36	12	27	47	54	802
5	202	870	5,100	1,230	552	108	36	15	27	63	60	1,070
6	202	744	3,860	1,500	552	92	32	17	27	60	60	1,130
7	202	678	2,990	1,820	512	92	32	17	27	54	54	1,110
8	202	635	2,530	1,740	502	89	34	17	27	54	72	1,050
9	202	605	2,430	2,150	487	89	29	17	27	50	96	994
10	202	557	2,690	2,470	512	78	27	17	27	47	108	945
11	180	545	2,790	2,690	760	72	27	17	27	47	124	898
12	180	490	3,130	2,690	760	57	27	17	27	47	140	838
13	180	501	3,410	2,470	700	54	27	17	27	47	164	742
14	180	575	3,810	2,060	625	54	27	20	32	47	147	642
15	180	730	3,900	1,690	552	50	24	20	32	47	135	522
16	156	678	3,780	1,500	502	54	24	20	32	47	124	424
17	156	665	3,960	1,390	452	68	21	20	36	47	112	391
18	300	605	4,060	1,390	405	72	20	20	36	50	112	368
19	1,020	593	4,010	1,570	359	68	20	20	36	54	112	325
20	292	545	5,610	1,720	325	68	20	20	42	54	112	305
21	381	545	5,180	1,530	285	68	20	20	36	54	135	278
22	980	518	4,090	1,330	255	63	20	20	38	54	512	266
23	1,180	490	5,020	1,190	241	57	20	20	42	54	614	248
24	2,800	800	4,090	1,210	215	54	20	20	45	50	778	248
25	2,760	2,180	3,130	1,210	209	50	20	20	42	47	790	248
26	2,240	1,830	2,530	1,130	200	47	20	20	38	47	718	266
27	1,450	1,830	2,120	945	200	47	20	20	42	54	659	285
28	1,340	2,600	1,790	820	200	45	20	21	38	54	572	285
29	1,260	.....	1,600	700	185	42	20	21	36	54	512	285
30	1,120	.....	1,370	614	164	38	20	24	36	54	502	305
31	1,100	.....	1,310	.....	154	.....	20	27	.....	54	.....	305

NOTE.—Daily discharges determined from rating curves fairly well defined. Discharges for Jan. 3-10 have been reduced 10 per cent and for Jan. 11-17 20 per cent because of ice effect.

Monthly discharge of Umatilla River near Yoakum, Oreg., for 1910.

[Drainage area, 1,200 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	2,800	156	695	0.579	0.67	42,700	C.
February	2,600	490	891	.742	.77	49,500	B.
March	6,260	1,310	3,580	2.98	3.44	220,000	B.
April	2,690	614	1,550	1.29	1.44	92,200	B.
May	760	154	417	.348	.40	25,600	B.
June	130	38	72.0	.060	.07	4,280	A.
July	38	20	25.6	.021	.02	1,570	A.
August	27	12	19.1	.016	.02	1,170	A.
September	45	27	33.1	.028	.03	1,970	A.
October	63	36	50.6	.042	.05	3,110	A.
November	790	54	258	.215	.24	15,400	A.
December	1,130	248	561	.468	.54	34,500	B.
The year	6,260	12	680	.567	7.69	492,000	

UMATILLA RIVER NEAR UMATILLA, OREG.

This station, which is located about 1½ miles above the mouth of the river, about 1¼ miles above Umatilla, Oreg., about one-half mile below the diversion dam of the Oregon Land & Water Co.'s canal, and one-fourth mile above the head gate of the Brownell ditch, was established October 21, 1903.

Records at this point show the quantity of water flowing into Columbia River after the irrigation requirements have been satisfied.

The gage is on the left bank and is in two sections, both of which are sloping and bolted securely into rock.

Discharge measurements are made from a cable 45 feet above the gage. It is equipped with a stay line for flood work.

The natural conditions affecting the flow during open water at this station are exceptionally good. The stream bed is nearly flat from bank to bank and is free from débris; the bed and banks for a long distance above and below the station are on solid rock; the velocity of the water is sufficiently swift to prevent the deposition of silt or sand, and even at extreme floods the water is all confined within the banks of the stream. Sufficient discharge measurements have been made to develop an absolutely permanent rating curve covering a range of stage from 0 to 11,000 second-feet. Ice is likely to affect the discharge considerably during the winter months.

The lower portion of the inclined gage was taken out by an ice jam about January 17 or 18, 1909, and was not repaired until September 21, 1910. In the meantime the observer made his readings by the use of a portion of the gage that remained intact, holding it on the same slope. The gage heights for 1909 and part of 1910 below 3.5

feet are, however, subject to error, and the daily and monthly estimates based on them are not so good as they should be.

The following discharge measurement was made by R. W. Davenport, by wading:

September 2, 1910: Width, 53 feet; area, 63.4 square feet; gage height, 2.26 feet; discharge, 42.6 second-feet.

Daily gage height, in feet, of Umatilla River near Umatilla, Oreg., for 1910.

[W. A. Walpole, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.95	3.6	4.3	4.0	3.05	2.45	1.85	1.85	2.3	2.3	2.3	2.9
2	.....	3.5	5.0	4.0	2.95	2.45	1.85	.....	.....	2.3	2.35	2.9
3	3.05	3.5	5.8	4.0	2.85	2.45	2.05	1.85	2.3	2.3	2.35	3.1
4	.....	3.25	6.5	4.0	2.85	2.45	.....	.....	2.3	2.3	2.4	3.25
5	3.05	3.25	6.0	3.9	2.95	2.45	2.05	1.95	.....	2.3	2.4	3.4
6	.....	.....	5.5	3.8	2.95	.....	.....	2.05	2.3	2.3	2.4	3.5
7	3.05	3.15	5.0	4.2	2.85	2.45	2.05	2.05	2.3	2.3	2.4	3.6
8	.....	.....	4.8	4.2	2.85	2.65	.....	.....	2.3	2.3	2.35	3.6
9	3.05	3.05	4.6	4.2	2.85	2.65	2.05	2.05	.....	2.3	2.35	3.5
10	.....	.....	4.5	4.6	2.85	2.65	.....	.....	2.25	2.25	2.35	3.5
11	2.95	2.85	4.4	4.7	2.90	2.65	2.65	2.05	2.25	2.25	2.3	3.45
12	.....	.....	4.8	4.7	3.15	.....	.....	2.15	2.25	2.35	2.3	3.35
13	2.95	2.85	5.0	4.6	3.15	2.55	2.45	2.15	2.3	2.35	2.35	3.2
14	.....	.....	5.3	4.5	3.05	2.25	.....	.....	.....	2.25	2.35	3.2
15	2.95	3.05	5.5	4.4	2.95	1.95	2.05	2.15	2.3	2.25	2.3	3.1
16	.....	.....	5.3	4.2	2.85	1.85	.....	.....	.....	2.3	2.3	3.0
17	2.95	2.95	5.3	4.0	2.85	1.85	2.05	2.15	2.3	2.25	2.3	2.9
18	.....	.....	5.3	4.0	2.75	.....	.....	2.25	.....	2.2	2.3	2.75
19	4.2	2.85	5.3	4.0	2.65	1.85	1.95	2.25	2.3	2.2	2.3	2.6
20	.....	.....	5.7	4.0	2.55	.....	.....	.....	.....	2.2	2.3	2.55
21	4.0	2.85	6.5	4.1	2.45	1.85	1.85	2.25	2.3	2.25	2.35	2.55
22	4.2	.....	5.8	4.0	2.45	.....	.....	.....	.....	2.25	2.35	2.55
23	4.3	2.85	5.8	4.0	2.45	1.85	1.85	2.25	2.3	2.25	2.4	2.5
24	4.7	.....	5.8	3.8	2.45	.....	.....	.....	2.3	2.25	2.4	2.5
25	4.6	3.8	5.7	3.6	2.45	1.85	1.85	2.25	2.3	2.25	2.4	2.45
26	4.3	4.1	5.4	3.6	2.45	1.85	.....	.....	2.3	2.25	2.5	2.45
27	4.0	4.1	4.7	3.5	2.45	1.85	1.85	2.25	2.3	2.25	2.55	2.45
28	.....	4.1	4.5	3.25	.....	.....	.....	.....	2.3	2.25	2.55	2.45
29	3.7	.....	4.3	3.15	2.45	1.85	1.85	2.25	2.3	2.25	2.6	2.45
30	3.6	.....	4.1	3.15	.....	1.85	.....	.....	2.3	2.3	2.8	2.45
31	3.4	.....	4.0	.....	2.45	.....	1.85	2.3	.....	2.3	.....	2.45

NOTE.—A little shore and floating ice during January and the first few days in February, but not sufficient to materially affect the gage readings.

Daily discharge, in second-feet, of Umatilla River near Umatilla, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	305	880	1,820	1,380	378	79	5.8	5.8	49	49	49	270
2	340	770	2,960	1,380	305	79	5.8	5.8	49	49	58	270
3	378	770	4,460	1,380	240	79	18	5.8	49	49	58	415
4	378	538	6,060	1,380	240	79	18	5.8	49	49	68	538
5	378	538	4,910	1,240	305	79	18	11	49	49	68	670
6	378	495	3,860	1,120	305	79	18	18	49	49	68	770
7	378	455	2,960	1,660	240	79	18	18	49	49	68	880
8	378	416	2,620	1,660	240	140	18	18	49	49	58	880
9	378	378	2,290	1,660	240	140	18	18	46	49	58	770
10	340	305	2,130	2,290	240	140	18	18	42	42	58	770
11	305	240	1,970	2,450	270	140	140	18	42	42	49	720
12	305	240	2,620	2,450	455	120	110	28	42	58	49	625
13	305	240	2,960	2,290	455	105	79	28	49	58	58	495
14	305	305	3,490	2,130	378	42	44	28	49	42	58	495
15	305	378	3,860	1,970	305	11	18	28	49	42	49	415
16	305	340	3,490	1,660	240	5.8	18	28	49	49	49	340
17	305	305	3,490	1,380	240	5.8	18	28	49	42	49	270
18	982	270	3,490	1,380	185	5.8	18	42	49	34	49	185
19	1,660	240	3,490	1,380	140	5.8	11	42	49	34	49	120
20	1,520	240	4,250	1,380	105	5.8	11	42	49	34	49	105
21	1,380	240	6,060	1,520	79	5.8	5.8	42	49	42	58	105
22	1,660	240	4,460	1,380	79	5.8	5.8	42	49	42	58	105
23	1,820	240	4,460	1,380	79	5.8	5.8	42	49	42	68	90
24	2,450	680	4,460	1,120	79	5.8	5.8	42	49	42	68	90
25	2,290	1,120	4,250	880	79	5.8	5.8	42	49	42	68	79
26	1,820	1,520	3,670	880	79	5.8	5.8	42	49	42	90	79
27	1,380	1,520	2,450	770	79	5.8	5.8	42	49	42	105	79
28	1,180	1,520	2,130	538	79	5.8	5.8	42	49	42	105	79
29	995	.....	1,820	455	79	5.8	5.8	42	49	42	120	79
30	880	.....	1,520	455	79	5.8	5.8	42	49	49	210	79
31	670	.....	1,380	.....	79	.....	5.8	49	.....	49	.....	79

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Umatilla River near Umatilla, Oreg., for 1910.

[Drainage area, 2,130 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	2,450	305	853	0.400	0.46	52,400	B.
February	1,520	240	551	.259	.27	30,600	B.
March	6,060	1,380	3,350	1.57	1.81	206,000	A.
April	2,450	455	1,430	.671	.75	85,100	A.
May	455	79	206	.097	.11	12,700	B.
June	140	5.8	49.3	.023	.03	2,930	B.
July	140	5.8	22.1	.010	.01	1,360	B.
August	49	5.8	29.2	.014	.02	1,800	B.
September	49	42	48.2	.023	.03	2,870	A.
October	58	42	45	.021	.02	2,770	A.
November	210	49	69	.032	.04	4,110	A.
December	880	79	353	.17	.20	21,700	A.
The year	6,060	5.8	586	.275	3.75	700,000	

JOHN DAY RIVER BASIN.

GENERAL FEATURES.

John Day River drains the country to the northwest of the Blue Mountains. The river rises on the divide between Grant and Baker counties, Oreg., flows westward and then northward, and joins Columbia River about 28 miles above The Dalles. Its principal tributaries are the North, Middle, and South Forks. Its total drainage area is 7,800 square miles.

The general elevation of its headwaters is about 6,000 feet above sea level; at Fossil the elevation is 1,500 feet. The headwater region of the stream is forested. Except wheat, which is grown on the rolling uplands by the "dry farming" process, no agricultural products of consequence can be raised without irrigation, and as the areas which admit of easy irrigation are confined to the immediate valleys of the streams comparatively little has been done in this direction. A number of projects are, however, contemplated, under which, by means of storage reservoirs and high-line canals, enormous areas of very productive table-lands would be developed. The storage facilities are ample for this purpose. It is not likely that extensive development will be undertaken until more detailed studies of flow have been made.

The mean annual rainfall varies from 24 inches on the headwaters to 10 inches at the mouth. The winters are cold, and the streams are frequently icebound throughout the greater part of the winter.

JOHN DAY RIVER NEAR DAYVILLE, OREG.

This station, which is located at a private wagon bridge on K. F. MacRae's ranch in sec. 4, T. 13, R. 27, 3 miles above Dayville, Oreg., and 3 miles above the mouth of the South Fork of John Day River, was established November 23, 1908.

The vertical staff gage is bolted to the center pier of the bridge, from which discharge measurements are made. The water is confined between the bridge abutments at all stages, but the river overflows at about a 3-foot stage a short distance below.

Results for low stages are of somewhat uncertain accuracy, but the accuracy of the yearly total is rated as good.

Discharge measurements of John Day River near Dayville, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 23	L. R. Allen	48	291	5.03	2,080
23	do	48	275	4.72	1,720
24	do	48	261	4.40	1,510
June 7	do	42	79	.40	147
Oct. 25	R. W. Davenport	35	68.2	.18	105

Daily gage height, in feet, of John Day River near Dayville, Oreg., for 1910.

[K. F. MacRae, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.3	1.0	4.95	2.4	1.95	0.75	.....	−0.9	−0.5	−0.2	0.2	1.1
2	.3	.8	5.0	2.5	1.75	.7	.....	− .9	− .6	.0	.2	1.0
3	.3	.6	5.05	2.35	1.55	.65	.....	− .9	− .6	+ .05	.2	1.5
4	.2	.6	3.9	2.2	1.55	.6	.....	− .9	− .7	.2	.2	2.0
5	.3	.8	4.1	2.15	1.45	.65	.....	−1.0	− .7	.2	.2	1.6
6	.3	1.0	3.0	2.25	1.45	.55	.....	−1.0	− .7	.15	.2	1.3
7	.3	.9	2.95	2.35	1.4	.45	.....	−1.0	− .6	.05	.25	1.1
8	.4	.9	2.85	2.3	1.2	.3	.....	−1.0	− .6	.1	.3	1.05
9	.6	.9	2.8	2.3	1.1	.3	.....	−1.0	− .5	.1	.4	1.3
10	.6	.9	2.75	2.8	1.4	.2	.....	−1.0	− .5	.1	.4	1.05
11	.6	.9	2.9	2.85	1.5	.3	.....	− .8	− .5	.15	.4	1.0
12	.7	1.0	3.1	2.75	1.45	.2	.....	− .7	− .5	.15	.5	1.0
13	.7	1.35	3.35	2.55	1.4	.1	.....	− .7	− .45	.15	.5	.9
14	.7	1.8	3.45	2.45	1.4	.1	.....	− .7	− .35	.15	.45	.9
15	.6	1.1	3.55	2.35	1.45	.....	.....	− .7	− .3	.15	.3	.8
16	.5	.8	3.55	2.5	1.25	.....	.....	− .6	− .2	.15	.3	.8
17	.5	.95	3.75	2.25	1.2	.....	.....	− .5	− .1	.2	.3	.8
18	.5	1.0	3.8	2.15	1.15	.....	.....	− .5	− .1	.2	.3	.8
19	.5	.9	4.4	2.25	1.05	.....	.....	− .5	− .1	.2	.4	.65
20	.5	.8	6.15	2.5	.95	.....	.....	− .4	− .1	.3	.4	.65
21	.6	.95	5.35	2.55	1.0	.....	.....	− .5	− .1	.3	.4	.65
22	1.5	.95	4.8	2.4	.85	.1	.....	− .5	− .1	.3	.7	.5
23	3.0	.9	4.9	2.4	.85	.15	.....	− .4	− .1	.25	.7	.7
24	3.8	1.7	4.2	2.35	.85	.15	.....	− .4	− .1	.2	.85	.7
25	1.7	2.55	3.75	2.45	.75	.1	.....	− .4	− .1	.2	.75	.7
26	1.4	2.0	3.5	2.45	.9	.15	.....	− .4	− .1	.2	.7	.65
27	1.2	1.55	3.2	2.45	.95	.....	.....	− .4	− .1	.2	.65	.65
28	1.2	3.95	2.85	2.4	1.0	.....	−0.6	− .4	− .1	.2	.9	.55
29	1.1	.....	2.7	2.25	.85	.....	− .7	− .4	− .2	.2	1.3	.5
30	1.0	.....	2.45	2.1	.85	.....	− .7	− .4	− .2	.2	1.4	.6
31	1.7	.....	2.4	.....	.85	.....	− .7	− .4	.....	.2	.....	.6

NOTE.—A little floating ice was reported occasionally, but gage heights were not affected.

Daily discharge, in second-feet, of John Day River near Dayville, Oreg., for 1909–10.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	124	224	316	500	392	682	268	72	15	72	106	292
2	124	235	316	528	392	718	246	58	23	72	124	292
3	128	235	316	650	444	830	224	58	23	58	124	224
4	154	246	353	588	472	1,040	142	58	58	72	124	182
5	142	246	366	500	528	910	124	58	58	88	124	162
6	142	246	366	472	500	830	124	58	58	88	124	162
7	142	224	340	472	472	650	124	58	58	88	124	224
8	142	224	340	444	472	650	142	58	58	106	124	246
9	142	213	353	418	472	650	202	58	45	106	124	246
10	142	213	340	418	444	634	224	45	58	106	124	246
11	142	192	340	444	444	500	224	45	58	106	142	246
12	142	202	340	444	444	444	224	45	58	88	142	246
13	142	224	328	458	444	472	202	33	58	88	142	268
14	300	246	328	500	444	472	202	33	58	88	142	268
15	450	246	328	500	418	444	202	33	58	88	124	268
16	600	246	392	500	418	500	202	33	58	88	124	246
17	754	950	392	500	366	444	142	33	58	88	106	224
18	754	528	444	500	366	444	115	33	58	106	106	224
19	528	472	486	486	366	444	97	33	58	106	124	224
20	830	472	444	486	392	444	88	23	58	106	124	202
21	790	366	444	472	418	444	88	23	58	106	224	202
22	790	340	431	444	431	444	80	23	58	106	246	142
23	500	353	418	444	444	392	80	15	58	106	588	124
24	392	366	418	392	444	366	80	15	58	106	718	124
25	366	366	472	418	444	340	58	9	58	106	444	124
76	353	353	486	418	444	316	58	9	58	106	392	124
08	328	353	500	444	444	292	59	9	58	106	292	106
29	246	340	528	472	514	292	65	9	58	106	292	106
12	202	.....	514	472	790	292	65	9	58	106	316	106
32	202	.....	500	444	754	268	72	15	72	106	292	106
23	224	.....	500	.....	682	.....	72	15	.....	106	.....	106
1910.												
1	106	246	1,920	648	518	219	60	5	22	50	110	302
2	106	202	1,950	678	465	208	60	5	16	76	110	278
3	106	162	1,980	633	413	197	60	5	16	84	110	400
4	88	162	1,240	588	413	186	60	5	11	110	110	532
5	106	202	1,360	574	387	197	60	3	11	110	110	426
6	106	246	830	603	387	176	50	3	11	101	110	350
7	106	224	810	633	374	156	50	3	16	84	119	302
8	124	224	772	618	326	128	50	3	16	92	128	290
9	162	224	754	618	302	128	50	3	22	92	146	350
10	162	224	736	772	374	110	50	3	22	92	146	290
11	162	224	790	788	400	128	40	7	22	101	146	278
12	182	246	870	756	387	110	40	11	22	101	166	278
13	182	328	972	693	374	92	40	11	26	101	166	254
14	182	444	1,020	663	374	92	40	11	35	101	156	254
15	162	268	1,060	633	387	75	40	11	40	101	128	230
16	142	202	1,060	618	338	75	30	16	50	101	128	230
17	142	235	1,160	603	326	70	30	22	62	110	128	230
18	142	246	1,190	574	314	70	30	22	62	110	128	230
19	142	224	1,540	603	290	70	30	22	62	110	146	197
20	142	202	2,940	678	266	70	30	30	62	128	146	197
21	162	235	2,220	693	278	75	20	22	62	128	146	197
22	366	235	1,810	648	242	92	20	22	62	128	208	166
23	830	224	1,880	648	242	101	20	30	62	119	208	208
24	1,190	418	1,420	633	242	101	20	30	62	110	242	208
25	418	666	1,160	663	219	92	20	30	62	110	219	208
26	340	500	1,040	663	254	101	16	30	62	110	208	197
27	292	379	912	663	266	75	16	30	62	110	197	197
28	292	1,270	788	648	278	70	16	30	62	110	254	176
29	268	.....	740	603	242	70	11	30	50	110	350	166
30	246	.....	663	560	242	70	11	30	50	110	374	186
31	418	.....	648	.....	242	.....	11	30	.....	110	.....	186

NOTE.—Daily discharge determined from rating curve applicable as follows:
Jan. 1, 1909, to Mar. 20, 1910, well defined between 80 and 400 second-feet.
Mar. 21 to Dec. 31, 1910, well defined between 80 and 400 second-feet.
Figures for 1909 supersede those published in Water-Supply Paper 272, page 367.

Monthly discharge of John Day River near Dayville, Oreg., for 1909–10.

[Drainage area, 1,000 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1909.							
January	830	124	337	0.337	0.39	20,700	C.
February	950	192	311	.311	.32	17,300	B.
March	528	316	401	.401	.46	24,700	A.
April	650	392	458	.458	.51	27,300	A.
May	790	366	468	.468	.54	28,800	A.
June	1,040	268	522	.522	.58	31,100	A.
July	268	58	139	.139	.16	8,550	A.
August	72	9	34.7	.035	.04	2,130	C.
September	72	15	54.3	.054	.06	3,230	C.
October	106	58	95.9	.096	.11	5,900	A.
November	718	106	210	.210	.23	12,500	A.
December	292	106	196	.196	.23	12,100	B.
The year	1,040	9	268	.268	3.63	194.000	
1910.							
January	1,190	88	241	0.241	0.28	14,800	B.
February	1,270	162	309	.309	.32	17,200	B.
March	2,940	648	1.230	1.23	1.42	75,600	B.
April	788	560	647	.647	.72	38,500	B.
May	518	219	328	.328	.38	20,200	A.
June	219	70	113	.113	.13	6,720	B.
July	60	11	34.9	.035	.04	2,150	C.
August	30	3	16.6	.017	.02	1,020	C.
September	62	11	40.1	.040	.04	2,390	C.
October	128	50	104	.104	.12	6,400	A.
November	374	110	168	.168	.19	10,000	A.
December	532	166	258	.258	.30	15,900	B.
The year	2,940	3	291	.291	3.96	211,000	

JOHN DAY RIVER AT M'DONALD, OREG.

This station, which is located at McDonald Ferry and post office, 16 miles above the mouth of the stream, and one-half mile below the mouth of Rock Creek, was established December 16, 1904.

An inclined gage is bolted to bridge timbers on the left bank 180 feet upstream from the cable from which discharge measurements are made. The datum of the gage has not been changed. The observations of gage height are exceptionally good and the discharge data are reliable. The winter gage heights are affected for short periods by ice.

Conditions at the station are very favorable for accurate determination of discharge, and what appears to be a permanent rating curve has been established.

The following measurement was made by L. R. Allen:

March 11, 1910: Width, 310 feet; area, 1,720 square feet; gage height, 5.64 feet; discharge, 7,830 second-feet. Made without sufficient weight and liable to some error.

Daily gage height, in feet, of John Day River at McDonald, Oreg., for 1910.

[Wm. Murray, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.55	3.2	5.6	4.8	4.25	2.6	1.7	1.1	1.05	1.35	1.6	2.6
2	2.25	3.55	7.1	4.8	4.1	2.55	1.65	1.1	1.05	1.35	1.6	2.95
3	2.45	3.05	7.8	4.9	4.0	2.5	1.6	1.1	1.05	1.35	1.6	2.7
4	2.55	2.95	7.5	4.9	3.9	2.4	1.6	1.1	1.05	1.4	1.6	2.75
5	2.5	2.75	7.1	4.7	3.8	2.4	1.6	1.1	1.05	1.4	1.6	2.75
6	2.25	2.7	7.25	4.5	3.8	2.25	1.55	1.1	1.05	1.4	1.6	3.6
7	2.3	2.85	6.25	4.5	3.7	2.2	1.55	1.1	1.05	1.4	1.6	3.0
8	2.5	2.95	5.0	4.9	3.5	2.1	1.5	1.05	1.05	1.4	1.6	2.9
9	2.5	2.85	4.85	4.9	3.5	2.1	1.5	1.05	1.05	1.6	1.6	2.7
10	2.55	2.7	5.7	5.1	3.5	2.0	1.5	1.05	1.05	1.6	1.65	2.8
11	2.65	2.6	5.75	5.45	3.8	2.0	1.45	1.05	1.05	1.55	1.7	2.7
12	2.6	2.6	5.8	5.55	4.0	2.1	1.4	1.05	1.1	1.5	1.7	2.7
13	2.6	2.7	6.0	5.5	3.95	2.1	1.4	1.05	1.1	1.5	1.75	2.6
14	2.6	2.9	6.15	5.4	3.75	2.0	1.35	1.05	1.1	1.5	1.8	2.7
15	2.7	2.95	6.3	5.25	3.65	1.95	1.35	1.05	1.1	1.5	1.9	2.6
16	2.7	3.45	6.4	4.95	3.5	1.95	1.3	1.05	1.1	1.5	1.9	2.5
17	2.7	3.0	6.5	4.8	3.4	1.9	1.3	1.05	1.1	1.5	1.9	2.3
18	2.95	2.7	6.5	4.7	3.3	1.9	1.3	1.05	1.1	1.5	1.85	2.2
19	2.9	2.7	6.6	4.7	3.2	1.9	1.3	1.05	1.1	1.5	1.75	2.4
20	2.4	2.65	6.8	4.85	3.1	1.9	1.25	1.05	1.2	1.5	1.75	2.3
21	2.2	2.65	7.8	5.15	3.0	1.9	1.25	1.05	1.3	1.55	1.7	2.3
22	3.95	2.65	7.7	5.25	3.0	1.9	1.25	1.05	1.4	1.55	1.7	2.15
23	3.9	2.7	7.2	5.0	2.9	1.85	1.25	1.05	1.4	1.55	1.8	2.0
24	4.55	2.6	7.75	4.85	2.8	1.85	1.2	1.05	1.4	1.6	1.85	2.05
25	5.25	4.6	6.8	4.8	2.95	1.8	1.2	1.05	1.35	1.6	2.0	2.1
26	4.3	5.1	6.25	4.9	2.7	1.8	1.2	1.05	1.35	1.6	2.1	2.1
27	3.5	4.65	5.95	4.9	2.7	1.8	1.15	1.05	1.35	1.55	2.2	2.2
28	3.3	4.2	5.6	4.9	2.75	1.75	1.15	1.05	1.35	1.55	2.1	2.2
29	3.2	.....	5.3	4.7	2.7	1.7	1.15	1.05	1.35	1.55	2.1	2.1
30	3.1	.....	5.1	4.5	2.7	1.7	1.15	1.05	1.35	1.6	2.45	2.1
31	3.0	.....	4.9	.....	2.7	.....	1.15	1.05	.....	1.6	.....	2.05

NOTE.—River full of slush ice during part of February; gage heights not sufficiently affected to warrant correction in the discharge.

Daily discharge, in second-feet, of John Day River at McDonald, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,060	1,890	7,050	5,020	3,760	1,120	320	68	59	145	260	1,120
2	762	2,430	11,400	5,020	3,440	1,070	290	68	59	145	260	1,550
3	962	1,680	13,700	5,260	3,240	1,020	260	68	59	145	260	1,240
4	1,060	1,550	12,700	5,260	3,050	910	260	68	59	165	260	1,300
5	1,020	1,300	11,400	4,780	2,870	910	260	68	59	165	260	1,300
6	762	1,240	11,900	4,320	2,870	762	235	68	59	165	260	2,520
7	810	1,420	8,860	4,320	2,690	715	235	68	59	165	260	1,620
8	1,020	1,550	5,500	5,260	2,340	625	210	59	59	165	260	1,480
9	1,020	1,420	5,140	5,260	2,340	625	210	59	59	260	260	1,240
10	1,060	1,240	7,320	5,750	2,340	540	210	59	59	260	290	1,360
11	1,180	1,120	7,460	6,650	2,870	540	188	59	59	235	320	1,240
12	1,120	1,120	7,590	6,920	3,240	625	165	59	68	210	320	1,240
13	1,120	1,240	8,150	6,780	3,140	625	165	59	68	210	352	1,120
14	1,120	1,480	8,570	6,520	2,780	540	145	59	68	210	385	1,240
15	1,240	1,550	9,000	6,130	2,600	500	145	59	68	210	460	1,120
16	1,240	2,260	9,290	5,380	2,340	500	125	59	68	210	460	1,020
17	1,240	1,620	9,580	5,020	2,180	460	125	59	68	210	460	810
18	1,550	1,240	9,580	4,780	2,040	460	125	59	68	210	422	715
19	1,480	1,240	9,880	4,780	1,890	460	125	59	68	210	352	910
20	910	1,180	10,500	5,140	1,750	460	109	59	93	210	352	810
21	715	1,180	13,700	5,880	1,620	460	109	59	125	235	320	810
22	3,140	1,180	13,400	6,130	1,620	460	109	59	165	235	320	670
23	3,050	1,240	11,700	5,500	1,480	423	109	59	165	235	385	540
24	4,440	1,120	13,600	5,140	1,360	422	93	59	165	260	422	582
25	6,130	4,550	10,500	5,020	1,550	385	93	59	145	260	540	625
26	3,870	5,750	8,860	5,260	1,240	385	93	59	145	260	625	625
27	2,340	4,670	8,010	5,260	1,240	385	80	59	145	235	715	715
28	2,040	3,650	7,050	5,260	1,300	352	80	59	145	235	625	715
29	1,890	.....	6,260	4,780	1,240	320	80	59	145	235	625	625
30	1,750	.....	5,750	4,320	1,240	320	80	59	145	260	962	625
31	1,620	.....	5,260	.....	1,240	.....	80	59	.....	260	.....	582

NOTE.—Daily discharge determined from a rating curve well defined between 100 and 12,000 second-feet,

Monthly discharge of John Day River at McDonald, Oreg., for 1910.

[Drainage area, 7,800 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	6,130	715	1,700	0.218	0.25	105,000	B.
February	5,750	1,120	1,900	.244	.25	106,000	B.
March	13,700	5,140	9,340	1.20	1.38	574,000	A.
April	6,920	4,320	5,360	.687	.77	319,000	A.
May	3,760	1,240	2,220	.285	.33	136,000	A.
June	1,120	320	579	.074	.08	34,500	A.
July	320	80	158	.020	.02	9,720	A.
August	68	59	61	.0078	.009	3,750	B.
September	165	59	92.5	.012	.01	5,500	B.
October	260	145	213	.027	.03	13,100	A.
November	962	260	402	.052	.06	23,900	A.
December	2,520	582	1,030	.132	.15	63,300	A.
The year	13,700	59	1,930	.247	3.34	1,390,000	

SOUTH FORK OF JOHN DAY RIVER AND DAYVILLE DITCH AT DAYVILLE, OREG.

This station, which is located one-half mile above Dayville and 1 mile above the mouth of the stream, was established November 21, 1908.

The vertical staff gage is fastened to an alder on the left bank about 10 feet above the cable from which discharge measurements are made.

The Dayville ditch diverts water about one-fourth mile above the station, and the flow in the ditch should be included in that of the main river to determine the natural flow at this point. A gage was installed on Dayville ditch and readings were begun June 12, 1910. This ditch carries a relatively small part of the flow of the river, except at extreme low water in the summer. The station on the river is well rated and the records are good.

Discharge measurements of South Fork of John Day River at Dayville, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 19	L. R. Allen	73	205	2.84	967
19	do	73	213	2.95	1,000
20	do	80	234	3.20	1,160
June 7	do	64	43	.40	49
Oct. 25[a]	R. W. Davenport	33	25	.19	22

[a] Measured by wading.

Daily gage height, in feet, of South Fork of John Day River at Dayville, Oreg., for 1910.

[J. C. Martin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.50	0.84	3.97	1.82	1.02	0.41	0.17	—0.04	—0.06	0.12	0.18	1.00
2	.40	.68	4.20	1.84	1.00	.41	.14	— .04	— .05	.12	.19	.95
3	.32	.62	3.40	1.80	1.05	.44	.16	— .04	— .05	.13	.19	2.03
4	.56	.79	2.73	1.70	1.08	.44	.20	— .04	— .04	.17	.19	2.03
5	.50	.79	2.48	1.66	1.02	.39	.19	— .04	— .02	.15	.19	1.00
6	.50	.75	2.15	1.65	.98	.39	.14	— .04	.08	.15	.20	.92
7	.55	.69	2.21	1.62	.97	.38	.12	— .04	.04	.15	.20	.85
8	.55	.70	2.03	1.62	.98	.32	.11	— .04	.03	.12	.25	.70
9	.48	.68	2.18	1.67	.86	.32	.10	— .04	.03	.12	.25	1.18
10	.50	.67	2.18	1.67	.91	.30	.06	— .05	.03	.12	.25	.92
11	.50	.69	2.28	1.70	.91	.29	.05	— .05	.03	.12	.25	1.00
12	.43	.71	2.30	1.64	.84	.30	.01	— .05	.04	.20	.26	1.04
13	.43	.86	2.29	1.58	.80	.28	0	— .05	.06	.20	.26	.90
14	.45	1.36	2.43	1.51	.79	.25	0	— .10	.07	.19	.25	.70
15	.43	.91	2.48	1.50	.75	.22	— .01	— .10	.08	.18	.25	.67
16	.41	.73	2.54	1.48	.72	.27	— .01	— .10	.10	.18	.26	.60
17	.41	.76	2.60	1.42	.70	.34	— .01	— .10	.11	.18	.26	.60
18	.51	.74	2.60	1.36	.68	.30	— .01	— .10	.11	.18	.29	.50
19	.52	.73	2.71	1.34	.66	.28	— .03	— .10	.10	.18	.26	.40
20	.46	.70	3.40	1.34	.60	.25	+ .01	— .10	.10	.18	.28	.40
21	.56	.65	3.18	1.34	.60	.25	.03	— .10	.10	.20	.29	.50
22	.90	.68	3.07	1.29	.59	.25	.01	— .10	.10	.20	.30	.51
23	1.82	.69	3.25	1.25	.57	.30	.01	— .10	.12	.20	.42	.52
24	1.80	2.11	2.70	1.20	.55	.25	0	— .10	.12	.20	.50	.50
25	1.30	2.11	2.52	1.18	.57	.23	0	— .10	.12	.21	.45	.5
26	.90	1.48	2.50	1.12	.57	.21	0	— .10	.12	.20	.42	.5
27	.83	1.29	2.18	1.10	.58	.21	0	— .08	.12	.20	.45	.5
28	.85	3.18	2.05	1.10	.56	.17	—.03	— .08	.12	.18	.72	.5
29	.70	.....	2.00	1.04	.53	.18	—.04	— .08	.12	.18	1.54	.5
30	.82	.....	1.91	1.03	.49	.16	—.03	— .08	.12	.18	1.30	.48
31	1.40	.....	1.89	.....	.46	.....	—.04	— .08	.....	.18	.....	.48

NOTE.—River frozen Jan. 1 to 8; gage heights evidently not materially affected.

Daily discharge, in second-feet, of South Fork of John Day River at Dayville, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	58	121	1,630	449	166	45	22	9.8	9.2	18	23	160
2	44	88	1,770	458	160	45	20	9.8	9.5	18	23	147
3	34	78	1,280	440	174	50	21	9.8	9.5	19	23	544
4	68	110	900	398	182	50	24	9.8	9.8	22	23	544
5	58	110	765	382	166	43	23	9.8	10	20	23	160
6	58	102	600	378	155	43	20	9.8	16	20	24	139
7	66	90	629	366	152	42	18	9.8	13	20	24	123
8	66	92	544	366	155	34	18	9.8	13	18	28	92
9	55	88	614	386	125	34	17	9.8	13	18	28	212
10	58	87	614	386	137	32	16	9.5	13	18	28	139
11	58	90	663	398	137	31	14	9.5	13	18	28	160
12	48	94	673	374	121	32	12	9.5	13	24	29	171
13	48	125	668	350	112	30	11	9.5	15	24	29	134
14	51	270	739	324	110	28	11	8	15	23	28	92
15	48	137	765	320	102	26	11	8	16	23	28	87
16	45	98	797	313	96	30	11	8	17	23	29	74
17	45	104	829	291	92	37	11	8	18	23	29	74
18	60	100	829	270	88	32	11	8	18	23	31	58
19	61	98	927	264	85	30	10	8	17	23	29	44
20	52	92	1,280	264	74	28	12	8	17	23	30	44
21	68	83	1,150	264	74	28	13	8	17	24	31	58
22	134	88	1,090	247	72	28	12	8	17	24	32	60
23	449	90	1,190	234	69	32	12	8	18	24	47	61
24	440	581	883	218	66	28	11	8	18	24	58	58
25	250	581	786	212	69	26	11	8	18	25	51	58
26	134	313	775	194	69	25	11	8	18	24	47	58
27	119	247	614	188	71	25	11	8.6	18	24	51	58
28	123	1,150	553	188	68	22	10	8.6	18	23	96	58
29	92	.....	530	171	63	23	9.8	8.6	18	23	335	58
30	116	.....	489	168	57	21	10	8	18	23	250	55
31	284	.....	476	.....	52	.....	9.8	8.6	.....	23	.....	55

NOTE.—Daily discharge determined from a rating curve well defined between 20 and 1,200 second-fee.

Monthly discharge of South Fork of John Day River at Dayville, Oreg., for 1910.

[Drainage area, 600 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	449	34	106	0.177	0.20	6,520	B.
February	1,150	78	190	.317	.33	10,600	B.
March	1,770	476	840	1.400	1.61	51,600	A.
April	458	168	309	.515	.57	18,400	A.
May	182	52	107	.179	.21	6,580	A.
June	50	21	32.7	.054	.06	1,950	A.
July	24	9.8	14	.023	.03	861	B.
August	9.8	8	8.79	.015	.02	540	B.
September	18	9.2	15.1	.025	.03	898	B.
October	25	18	21.9	.036	.04	1,350	A.
November	335	23	51.2	.085	.10	3,050	A.
December	544	44	12.4	.207	.24	7,620	A.
The year	1,770	8	152	.253	3.44	110,000	

Discharge measurements of Dayville ditch at Dayville, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 7	L. R. Allen	3.7	3.1	1.50	4.5
Oct. 25	R. W. Davenport	.....	1	.77	[a] .25
June 7	L. R. Allen	3.6	1.6	1.23	2.0

[a] Discharge and area estimated.

Daily gage height, in feet, of Dayville ditch at Dayville, Oreg., for 1910.

[J. C. Martin, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.03	0.98	1.61	0.78	0.77	1.20	16	1.41	1.10	1.40	1.05	0.75	0.80	0.70
2	.....	1.02	1.00	1.61	.78	.77	1.18	17	1.49	1.10	1.40	.95	.75	.80	.65
3	.....	.99	1.00	1.59	.76	.77	1.20	18	1.44	1.09	1.40	.90	.75	.80	.65
4	.....	1.07	.99	1.59	.72	.77	1.19	19	1.41	.98	1.40	.84	.75	.80	[a] .60
5	.....	1.05	.99	1.24	.72	.77	1.05	20	1.36	1.06	1.41	.80	.75	.80	.75
6	.....	1.00	.99	.80	.72	.77	.78	21	1.35	1.15	1.41	.78	.75	.81	.95
7	.....	.90	1.00	1.00	.72	.77	.75	22	1.35	1.03	1.41	.78	.75	.81	.75
8	.....	.92	1.00	1.00	.75	.78	.80	23	.99	1.06	1.39	.76	.77	.80	.77
9	.....	1.07	1.00	1.00	.75	.78	.82	24	.95	1.03	1.39	.78	.77	.75	.77
10	.....	1.05	1.01	1.00	.75	.78	.80	25	.95	1.03	1.41	.78	.77	.75	.79
11	.....	1.04	1.01	1.06	.75	.78	.80	26	.91	.95	1.44	.78	.77	.75	.79
12	1.45	1.18	1.01	1.10	.75	.80	.83	27	.91	.98	1.48	.78	.77	.75	.79
13	1.42	1.15	1.02	1.02	.75	.80	.80	28	.90	.95	1.50	.78	.77	.80	.79
14	1.34	1.20	1.25	.95	.75	.78	.78	29	.90	.95	1.50	.78	.77	1.22	.79
15	1.30	1.10	1.36	.92	.75	.78	.75	30	1.03	.98	1.53	.78	.77	1.12	.78
								31	.....	.99	1.59	.....	.77	.....	.78

[a] Dry.

Daily discharge, in second-feet, of Dayville ditch at Dayville, Oreg., for 1910.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.9	0.7	5.7	0.3	0.3	1.8	16	3.6	1.2	3.5	1.0	0.2	0.3	0.2
2	.....	.8	.8	5.7	.3	.3	1.7	17	4.4	1.2	3.5	.6	.2	.3	.2
3	.....	.8	.8	5.5	.3	.3	1.8	18	3.9	1.2	3.5	.5	.2	.3	.2
4	.....	1.1	.8	5.5	.2	.3	1.7	19	3.6	.7	3.5	.4	.2	.3	.1
5	.....	1.0	.8	2.1	.2	.3	1.0	20	3.1	1.0	3.6	.3	.2	.3	.2
6	.....	.8	.8	.3	.2	.3	.3	21	3.0	1.5	3.6	.3	.2	.3	.6
7	.....	.5	.8	.8	.2	.3	.2	22	3.0	.9	3.6	.3	.2	.3	.2
8	3.5	.6	.8	.8	.2	.3	.3	23	.8	1.0	3.4	.3	.3	.3	.3
9	3.9	1.1	.8	.8	.2	.3	.3	24	.6	.9	3.4	.3	.3	.2	.3
10	3.7	1.0	.8	.8	.2	.3	.3	25	.6	.9	3.6	.3	.3	.2	.3
11	3.5	1.0	.8	1.0	.2	.3	.3	26	.5	.6	3.9	.3	.3	.2	.3
12	4.0	1.7	.8	1.2	.2	.3	.4	27	.5	.7	4.3	.3	.3	.2	.3
13	3.7	1.5	.9	.9	.2	.3	.3	28	.5	.6	4.5	.3	.3	.3	.3
14	3.0	1.8	2.2	.6	.2	.3	.3	29	.7	.6	4.5	.3	.3	2.0	.3
15	2.6	1.2	3.1	.6	.2	.3	.2	30	.9	.7	4.8	.3	.3	1.3	.3
								31	.....	.8	5.5	.....	.3	.....	.3

NOTE.—Daily discharge determined from a fairly well-defined rating curve. During the summer and fall the relation of gage height and discharge may be somewhat affected by weeds and leaves in the ditch.

Monthly discharge of Dayville ditch at Dayville, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 8-30	4.4	0.5	2.50	114	B.
July	1.8	.5	.98	60.3	B.
August	5.5	.7	2.53	156	B.
September	5.7	.3	1.27	75.6	B.
October	.3	.2	.24	14.8	B.
November	2.0	.2	.38	22.6	B.
December	1.8	.1	.49	30.1	B.
The period	5.7	.1	1.15	473	

DESCHUTES RIVER BASIN.

GENERAL FEATURES.

Deschutes River has its source in a number of mountain lakes at the summit of the Cascade Range just east of the headwaters of Willamette River in Klamath and Crook counties, Oreg. Its course is northward to Columbia River, which it enters about 15 miles above The Dalles.

The principal tributaries of Deschutes River are White, Warm Springs, Metolius, and Crooked rivers and the West Fork of the Deschutes. All except the Crooked River drain the eastern slope of the Cascades and contribute the larger portion of the stream flow. The entire drainage area of the system is 9,180 square miles, distributed as follows:

Area of Deschutes River basin.

	Square miles.
Deschutes at Bend	1,530
Deschutes above the mouth of Crooked River	2,520
Deschutes at Sherar Bridge	8,750
Deschutes River above Lava post office (locally known as Little River)	720
Crooked River	2,920
East Fork of Deschutes River	200
West Fork of Deschutes River	500

Topographically the area is rough and mountainous. The agricultural lands consist largely of high table-lands cut by deep canyons, through which the rivers flow, and small arable areas which border the streams. The soil is a coarse disintegrated lava. The rocks of the entire area are volcanic and so peculiarly porous that the basin acts like a huge sponge in the matter of ground storage. Deschutes River has perhaps the most remarkable uniform flow of any river comparable with it in size, and its economic value is almost incalculable. At the mouth of the stream the maximum flow is six times and at Bend only three times the minimum. Ocular evidence of this uniformity of flow is presented by the low grass-grown banks between which the river flows throughout its upper portions.

The general elevation of the lands around Bend is 3,600 feet above sea level; that of the summit of the Cascade Mountains is from 5,000 to 6,000 feet. Prineville is 2,868 feet above sea level and Paulina, near the upper portion of the Crooked River drainage basin, 3,684 feet.

The timbered portion of this drainage basin is found on the eastern slope of the Cascades and on the headwaters of Crooked River.

The annual rainfall varies from 100 inches on the summit of the Cascade Mountains to 10 inches along the main course of the stream. At Prineville the mean annual rainfall is 9 inches; at Warm Springs, 11 inches; at Bend, 15 inches. On the headwaters of Crooked River the precipitation is probably 20 inches or more.

Although the winter temperatures are low, ice does not affect the determination of stream flow to any extent. This is due to the fact that the waters reach the river in the form of springs. The high stages usually occur in July as the result of the melting of snows in the mountains, although occasionally floods are caused by chinook winds in the early spring or late fall.

It has been estimated that Deschutes River alone from Bend to the mouth, a distance of 140 miles, is capable of furnishing over a million horsepower. Power plants need fear neither shortage of water during the summer months nor damage from flood. During the low-water period, throughout the lower 130 miles of the river's course, it flows in a narrow canyon with an average fall of about 20 feet to the mile, and conditions are such that a succession of dams could be built almost throughout its entire length.

DESCHUTES RIVER NEAR LAPINE, OREG.

This station, which, in cooperation with the United States Forest Service, is located in sec. 10, T. 22 S., R. 10 E., at a highway bridge near the Forest Service ranger station, about 2 miles below the present site of the post office at Lapine, Oreg., was established September 22, 1910.

Discharge measurements are made from the highway bridge to which the gage is attached.

As forest rangers are not constantly detailed to this station, the gage-height observations are somewhat irregular.

Gage heights are probably somewhat affected by ice during the winter months.

Discharge measurements of Deschutes River near Lapine, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 22	Allen and Davenport	53	140	1.15	132
Nov. 19	R. W. Davenport	53	145	1.32	154
26[a]	do	55	178	1.85	224

[a] Some running ice.

Daily gage height, in feet, of Deschutes River near Lapine, Oreg., for 1910.

[Mahn and Robertson, observers.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		0.99	1.03	2.72	16			1.27	
2		1.00	1.03	2.80	17			1.25	
3		1.14	1.01	2.74	18			1.38	
4		1.25		2.83	19			1.32	
5		1.59		2.79	20			1.30	
6		1.45			21			1.50	1.65
7		1.38	1.00	2.28	22	1.14	1.13	1.78	1.65
8		1.29	1.29		23	1.10		1.94	
9		1.24	2.00		24	1.06	1.09	2.50	1.50
10		1.19	1.90		25	1.03	1.09	1.68	1.70
11		1.15	1.80		26	1.02	1.08		
12		1.25	1.80		27	1.00	1.08		1.48
13		1.29	1.60		28		1.06	2.78	1.45
14			1.45		29		1.05	1.80	1.40
15			1.40		30	.98	1.04	2.35	1.40
					31		1.04		

NOTE.—Gage heights affected by ice Dec. 24 to 31; ice 6 to 10 feet wide along the banks.

DESCHUTES RIVER AT ALLEN'S RANCH, NEAR LAVA, OREG.[1]

This station was established February 17, 1905, on C. B. Allen's ranch, about 1 mile north of Lava, Oreg., in the SW. ¼ SW. ¼ sec. 8, T. 20 S., R. 11 E. It is half a mile above the mouth of the West Fork of Deschutes River.

[1] The river at this point is locally known as "Little River."

The inclined staff gage is on the east bank of the river, about 50 feet above the cable from which discharge measurements are made. The gage datum has not been changed, but the records are not as accurate as they should be, owing to a troublesome growth of weeds that appears in the river in the vicinity of the station during the summer months. As the season advances these weeds greatly retard the flow and cause backwater at the gage.

Ice is likely to affect the discharge somewhat during December, January, and February.

Discharge measurements of Deschutes River near Lava, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 26	L. R. Allen	73	280	7.38	509
June 20	do	58	211	6.40	258
Sept. 21	R. W. Davenport	55	172	5.66	112
Nov. 17	do	55	168	5.52	153
18	do	55	171	5.59	162

Daily gage height, in feet, of Deschutes River near Lava, Oreg., for 1910.

[Mrs. C. B. Allen, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.0	7.3	7.8	7.25	7.55	6.75	6.05	5.65	5.5	5.4	5.3	6.15
2	7.2	7.4	8.05	7.3	7.6	6.7	6.05	5.65	5.5	5.4	5.3	6.6
3	7.6	8.1	8.1	7.3	7.7	6.7	6.05	5.65	5.45	5.55	5.3	7.0
4	7.7	7.9	8.4	7.3	7.7	6.65	6.1	5.65	5.45	5.6	5.3	7.1
5	7.65	7.7	9.0	7.3	7.65	6.65	6.1	5.6	5.45	5.65	5.3	6.75
6	7.65	6.7	8.6	7.25	7.6	6.6	6.05	5.6	5.45	5.8	5.3	6.6
7	7.7	6.8	8.65	7.15	7.5	6.55	6.0	5.6	5.4	5.8	5.4	6.4
8	7.8	6.9	8.45	7.1	7.3	6.55	6.0	5.6	5.4	5.65	5.55	6.35
9	7.8	6.9	8.2	7.1	7.2	6.5	5.95	5.6	5.4	5.6	5.6	6.35
10	7.8	6.9	7.8	7.15	7.4	6.45	5.95	5.6	5.4	5.6	5.95	6.35
11	7.0	6.9	7.55	7.15	7.45	6.5	5.9	5.6	5.4	5.6	6.0	6.3
12	6.85	6.85	7.6	7.15	7.5	6.45	5.9	5.6	5.4	5.6	5.9	6.25
13	6.8	6.9	7.5	7.15	7.6	6.5	5.9	5.6	5.45	5.6	5.85	6.25
14	6.8	6.95	7.5	7.15	7.6	6.45	5.85	5.6	5.45	5.6	5.7	6.15
15	6.8	7.0	7.5	7.15	7.5	6.4	5.85	5.55	5.45	5.6	5.6	6.1
16	6.75	6.9	7.55	7.1	7.4	6.4	5.85	5.55	5.45	5.55	5.5	6.0
17	6.7	6.8	7.55	7.1	7.3	6.4	5.85	5.55	5.45	5.55	5.45	5.9
18	6.75	6.9	7.6	7.1	7.25	6.4	5.8	5.55	5.45	5.55	5.5	5.9
19	6.8	6.95	7.6	7.1	7.15	6.35	5.8	5.55	5.5	5.5	5.5	5.8
20	6.75	6.9	7.65	7.1	7.05	6.3	5.8	5.5	5.55	5.5	5.5	5.5
21	6.75	6.9	7.7	7.1	7.0	6.3	5.8	5.5	5.6	5.45	5.55	5.6
22	6.8	6.9	7.8	7.15	6.95	6.35	5.8	5.5	5.6	5.45	5.7	5.6
23	7.0	6.9	7.9	7.2	6.9	6.35	5.8	5.5	5.55	5.45	6.05	5.7
24	7.25	6.95	7.9	7.25	6.9	6.35	5.8	5.5	5.55	5.45	6.15	5.8
25	7.3	7.0	7.9	7.3	6.85	6.25	5.75	5.5	5.5	5.45	6.35	5.6
26	7.35	7.1	7.9	7.3	6.85	6.2	5.75	5.5	5.5	5.4	6.1	5.65
27	7.4	7.2	7.75	7.3	6.85	6.2	5.75	5.5	5.45	5.35	5.9	5.7
28	7.4	7.4	7.6	7.4	6.9	6.1	5.7	5.5	5.45	5.3	5.6	5.7
29	7.4	.....	7.45	7.45	6.9	6.1	5.7	5.5	5.45	5.3	6.0	5.6
30	7.3	.....	7.4	7.5	6.85	6.1	5.7	5.5	5.4	5.3	6.05	5.7
31	7.3	.....	7.3	.....	6.8	.....	5.7	5.5	.....	5.3	.....	5.65

NOTE.—River frozen over during most of January and February and a part of December; exact effect of ice uncertain.

Daily discharge, in second-feet, of Deschutes River near Lava, Oreg., for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	694	513	608	368	214	154	135	125	115	232
2	790	528	624	355	214	154	135	125	115	329
3	810	528	658	355	214	154	130	141	115	439
4	930	528	658	342	223	154	130	147	115	468
5	970	528	641	342	223	147	130	154	115	368
6	1,010	513	624	329	214	147	130	173	115	329
7	1,030	483	591	317	205	147	125	173	125	283
8	950	468	528	317	205	147	125	154	141	272
9	850	468	498	305	196	147	125	147	147	272
10	694	483	559	294	196	147	125	147	196	272
11	608	483	575	305	188	147	125	147	205	262
12	624	483	591	294	188	147	125	147	188	252
13	591	483	624	305	188	147	130	147	180	252
14	591	483	624	294	180	147	130	147	160	232
15	591	483	591	283	180	141	130	147	147	223
16	608	468	559	283	180	141	130	141	135	205
17	608	468	528	283	180	141	130	141	130	188
18	624	468	513	283	173	141	130	141	135	188
19	624	468	483	272	173	141	135	135	135	173
20	641	468	454	262	173	135	141	135	135	135
21	658	468	439	262	173	135	147	130	141	14
22	694	483	424	272	173	135	147	130	160	147
23	732	498	410	272	173	135	141	130	214	160
24	732	513	410	272	173	135	141	130	232	173
25	732	528	396	252	166	135	135	130	272	147
26	732	528	396	242	166	135	135	125	223	154
27	676	528	396	242	166	135	130	120	188	160
28	624	559	410	223	160	135	130	115	147	160
29	575	575	410	223	160	135	130	115	205	147
30	559	591	396	223	160	135	125	115	214	160
31	528	.....	382	.....	160	135	.....	115	.....	154

NOTE.—Daily discharge determined from a rating curve fairly well defined between 200 and 600 second-feet, but rather uncertain outside these limits. It is a mean curve based on all measurements at this station.

Monthly discharge of Deschutes River near Lava, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	(a)	350	21,500	D.
February	.....	(a)	350	19,400	D.
March	1,030	528	712	43,800	C.
April	591	468	502	29,900	C.
May	658	382	516	31,700	C.
June	368	223	289	17,200	C.
July	223	160	185	11,400	C.
August	154	135	142	8,730	C.
September	147	125	132	7,860	C.
October	173	115	138	8,480	C.
November	272	115	162	9,640	C.
December	468	135	229	14,100	C.
The year	1,030	115	309	224,000	

a Estimated.

DESCHUTES RIVER AT BENHAM FALLS, NEAR BEND, OREG.

This station, which is located 700 feet above Benham Falls, about 14 miles above Bend, Oreg., and above the intake of an irrigation canal under construction at this point, was established April 1, 1909, and is maintained in cooperation with the Deschutes Irrigation & Power Co.

On July 29, 1909, a cable was installed for making discharge measurements and a staff gage placed on the right bank near the cable.

Better conditions were found at this point than obtained at the section of the lower gage installed by the Deschutes Irrigation & Power Co., which reads 3.35 feet lower than the United States Geological Survey gage.

The banks of the stream in the vicinity of the cable are low, but are not subject to overflow. The channel is straight and the bed of the stream is of sand and gravel. Weeds grow along each bank and may interfere somewhat with the determination of discharge in the summer months.

The results at this station are comparable with those formerly obtained at West's ranch, about 4 miles upstream from this point.

Discharge measurements of Deschutes River at Benham Falls, near Bend, Oreg., 1909–10.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1909.					
July 30	R. B. Post	137	969	4.00	1,560
1910.					
Apr. 21	L. R. Allen	137	1,080	4.67	1,920
June 21	do	138	1,060	4.35	1,800
Sept. 20	Allen and Davenport	139	1,060	4.06	1,530
Nov. 17	R. W. Davenport	137	1,040	3.95	1,430
Dec. 27	do	137	1,030	3.94	1,440

Daily gage height, in feet, of Deschutes River at Benham Falls, near Bend, Oreg., for 1910.

[Olvin and Gates, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.2	4.0	4.7	4.7	4.8	4.55	4.3	4.15	4.05	4.0	3.9	4.15
2	4.1	3.9	4.9	4.8	4.8	4.5	4.3	4.15	4.05	4.0	3.9	4.30
3	3.9	3.9	5.0	4.7	4.9	4.5	4.3	4.15	4.05	4.0	3.9	4.45
4	3.75	4.0	5.1	4.7	4.9	4.5	.....	4.1	4.05	4.05	3.9	4.45
5	3.75	4.1	5.2	4.8	4.9	4.5	4.3	4.1	4.05	4.05	3.9	4.40
6	3.85	4.0	5.2	4.7	4.9	4.5	4.3	4.1	4.05	4.1	3.9	4.35
7	3.95	4.0	5.2	4.7	4.85	4.45	4.3	4.1	4.05	4.05	3.95	4.30
8	3.95	4.1	5.3	4.75	4.8	4.45	4.25	4.1	4.05	4.05	4.0	4.25
9	4.1	4.2	5.0	4.65	4.7	4.45	4.25	4.1	4.05	4.0	4.0	4.25
10	4.2	4.2	4.9	4.65	4.8	4.4	4.2	4.1	4.0	4.0	4.05	4.25
11	4.2	4.2	4.9	4.75	4.9	4.4	4.2	4.1	4.0	4.0	4.1	4.22
12	4.3	4.3	4.8	4.65	4.85	4.4	4.2	4.1	4.0	4.0	4.1	4.22
13	4.1	4.1	4.8	4.65	4.85	4.4	4.2	4.1	4.0	4.0	4.05	4.20
14	4.1	4.1	4.8	4.65	4.85	4.4	4.2	4.1	4.05	4.0	4.0	4.18
15	4.2	4.2	4.9	4.75	4.85	4.4	4.2	4.1	4.05	4.0	4.0	4.17
16	4.1	4.2	.....	4.6	4.8	4.4	4.2	4.1	4.0	4.0	3.95	4.10
17	4.0	4.2	.....	4.6	4.75	4.4	.....	4.1	4.0	4.0	3.95	4.10
18	4.0	4.4	4.8	4.6	4.75	4.4	4.2	4.1	4.0	4.0	3.95	4.10
19	4.1	4.3	4.9	4.7	4.7	4.4	4.2	4.1	4.0	4.0	3.95	4.05
20	4.0	4.2	4.8	4.7	4.7	4.4	4.2	4.1	4.05	4.0	4.0	3.95
21	4.0	4.3	4.8	4.6	4.65	4.4	4.2	4.1	4.05	4.0	4.0	3.90
22	4.0	4.2	4.8	4.65	4.65	4.4	4.2	4.1	4.05	4.0	4.0	3.90
23	4.2	4.2	4.9	4.7	4.6	4.4	4.2	4.1	4.05	3.95	4.1	3.95
24	4.2	4.2	4.9	4.7	4.6	4.4	4.2	4.05	4.0	3.95	4.2	4.00
25	4.2	4.3	4.9	4.75	4.6	4.4	4.2	4.05	4.0	3.95	4.2	4.00
26	4.4	4.2	4.9	4.75	4.6	4.35	4.2	4.05	4.0	3.95	4.2	3.95
27	4.2	4.2	4.8	4.75	4.6	4.3	4.15	4.05	4.0	3.95	4.1	3.95
28	4.2	4.6	4.8	4.8	4.6	4.3	4.15	4.05	4.0	3.9	4.05	3.93
29	4.2	.....	4.8	4.8	4.6	4.3	4.15	4.05	4.0	3.9	4.1	3.92
30	4.3	.....	4.8	4.8	4.55	4.3	4.15	4.05	4.0	3.9	4.2	3.93
31	4.0	.....	4.7	.....	4.55	.....	4.15	4.05	.....	3.9	.....	3.94

NOTE.—No ice at this station.

Daily discharge, in second-feet, of Deschutes River at Benham Falls, near Bend, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,600	1,480	1,950	1,950	2,020	1,840	1,670	1,570	1,510	1,480	1,420	1,570
2	1,540	1,420	2,090	2,020	2,020	1,810	1,670	1,570	1,510	1,480	1,420	1,670
3	1,420	1,420	2,160	1,950	2,090	1,810	1,670	1,570	1,510	1,480	1,420	1,780
4	1,330	1,480	2,230	1,950	2,090	1,810	1,670	1,540	1,510	1,510	1,420	1,780
5	1,330	1,540	2,300	2,020	2,090	1,810	1,670	1,540	1,510	1,510	1,420	1,740
6	1,390	1,480	2,300	1,950	2,090	1,810	1,670	1,540	1,510	1,540	1,420	1,700
7	1,450	1,480	2,300	1,950	2,060	1,780	1,670	1,540	1,510	1,510	1,450	1,670
8	1,450	1,540	2,380	1,980	2,020	1,780	1,640	1,540	1,510	1,510	1,480	1,640
9	1,540	1,600	2,160	1,920	1,950	1,780	1,640	1,540	1,510	1,480	1,480	1,640
10	1,600	1,600	2,090	1,920	2,020	1,740	1,600	1,540	1,480	1,480	1,510	1,640
11	1,600	1,600	2,090	1,980	2,090	1,740	1,600	1,540	1,480	1,480	1,540	1,600
12	1,670	1,670	2,020	1,920	2,060	1,740	1,600	1,540	1,480	1,480	1,540	1,600
13	1,540	1,540	2,020	1,920	2,060	1,740	1,600	1,540	1,480	1,480	1,510	1,600
14	1,540	1,540	2,020	1,920	2,060	1,740	1,600	1,540	1,510	1,480	1,480	1,600
15	1,600	1,600	2,090	1,980	2,060	1,740	1,600	1,540	1,510	1,480	1,480	1,570
16	1,540	1,600	2,090	1,880	2,020	1,740	1,600	1,540	1,480	1,480	1,450	1,540
17	1,480	1,600	2,020	1,880	1,980	1,740	1,600	1,540	1,480	1,480	1,450	1,540
18	1,480	1,740	2,020	1,880	1,980	1,740	1,600	1,540	1,480	1,480	1,450	1,540
19	1,540	1,670	2,090	1,950	1,950	1,740	1,600	1,540	1,480	1,480	1,450	1,510
20	1,480	1,600	2,020	1,950	1,950	1,740	1,600	1,540	1,510	1,480	1,480	1,450
21	1,480	1,670	2,020	1,880	1,920	1,740	1,600	1,540	1,510	1,480	1,480	1,420
22	1,480	1,600	2,020	1,920	1,920	1,740	1,600	1,540	1,510	1,480	1,480	1,420
23	1,600	1,600	2,090	1,950	1,880	1,740	1,600	1,540	1,510	1,450	1,540	1,450
24	1,600	1,600	2,090	1,950	1,880	1,740	1,600	1,510	1,480	1,450	1,600	1,480
25	1,600	1,670	2,090	1,980	1,880	1,740	1,600	1,510	1,480	1,450	1,600	1,480
26	1,740	1,600	2,090	1,980	1,880	1,700	1,600	1,510	1,480	1,450	1,600	1,450
27	1,600	1,600	2,020	1,980	1,880	1,670	1,570	1,510	1,480	1,450	1,540	1,450
28	1,600	1,880	2,020	2,020	1,880	1,670	1,570	1,510	1,480	1,420	1,510	1,450
29	1,600	.....	2,020	2,020	1,880	1,670	1,570	1,510	1,480	1,420	1,540	1,420
30	1,670	.....	2,020	2,020	1,840	1,670	1,570	1,510	1,480	1,420	1,600	1,450
31	1,480	.....	1,950	.....	1,840	.....	1,570	1,510	.....	1,420	.....	1,450

NOTE.—Daily discharge determined from a rating curve well defined between 1,400 and 2,000 second-feet.

Monthly discharge of Deschutes River at Benham Falls, near Bend, Oreg., for 1910.

[Drainage area, 1,480 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	1,740	1,330	1,530	1.03	1.19	94,100	A.
February	1,880	1,420	1,590	1.07	1.11	88,300	A.
March	2,380	1,950	2,090	1.41	1.63	129,000	A.
April	2,020	1,880	1,950	1.32	1.47	116,000	A.
May	2,090	1,840	1,980	1.34	1.54	122,000	A.
June	1,840	1,670	1,750	1.18	1.32	104,000	A.
July	1,670	1,570	1,610	1.09	1.26	99,000	A.
August	1,570	1,510	1,540	1.04	1.20	94,700	A.
September	1,510	1,480	1,500	1.01	1.13	89,300	A.
October	1,540	1,420	1,470	.993	1.14	90,400	A.
November	1,600	1,420	1,490	1.01	1.13	88,700	A.
December	1,780	1,420	1,560	1.05	1.21	95,900	A.
The year	2,380	1,330	1,670	1.13	15.33	1,210,000	

DESCHUTES RIVER AT BEND, OREG.

A station was established at Sizemore's bridge, near Bend, December 22, 1904, and data were published for 1905 and 1906, but the conditions were not favorable for accurate results, as the channel at this point is comparatively shallow and exceedingly rough, and the gage heights are influenced by backwater from saw logs impounded

at a mill below the station, and some of the data for these years are therefore not wholly reliable.

On March 30, 1907, gage records were suspended at this point, and on April 23, 1907, the station was reestablished at Statt's bridge, in Bend, Oreg. A vertical staff gage was bolted to a bowlder near the pumping plant.

The records of gage heights are furnished without cost to the survey by Mr. C. A. Stanburrough, engineer of the city pumping plant.

A gage was installed September 18, 1910, above the dam of the Bend Electric Light Co. and has been read regularly since October 1. Both gages have been rated by measurements made at the upper highway bridge in Bend in 1910 and 1911. The records thus obtained give the flow of the river below the diversions in the Central Oregon and Pilot Butte canals, and in general check very closely with the difference between the discharge of the river at Benham Falls and the canals. The rating for the gage at the pumping plant differs only slightly from that derived by differences and applied for 1909.

Discharge measurements of Deschutes River at Bend, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Nov. 14	R. W. Davenport	100	788	[a] 1.56	1,560
Dec. 28	do	100	807	[b] 1.41	1,360

[a] Reading on new gage, 1.56 feet. [b] Reading on new gage, 1.48 feet.

Daily gage height, in feet, of Deschutes River at Bend, Oreg., for 1910.

[Gage at pumping plant. C. A. Stanburrough, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	1.65	1.65	1.9	1.95	1.8	1.7	1.25	1.05	1.35	1.15
2	1.65	1.65	2.0	1.95	1.8	1.6	1.20	1.04	1.35	1.2
3	1.35	1.6	2.05	1.9	1.85	1.6	1.25	1.45	1.15	1.2
4	1.4	1.5	2.15	1.9	1.9	1.7	1.25	1.45	1.1	1.2
5	1.6	1.6	2.2	1.85	1.9	1.5	1.25	1.4	1.05	1.25
6	1.5	1.7	2.3	1.85	1.9	1.45	1.25	1.4	1.1	1.3
7	1.6	1.5	2.3	1.85	1.85	1.4	1.2	1.4	1.1	1.25
8	1.65	1.6	2.3	1.8	1.8	1.35	1.2	1.4	1.1	1.25
9	1.65	1.6	2.2	1.85	1.8	1.35	1.2	1.4	1.1	.....
10	1.7	1.6	2.1	1.8	1.8	1.3	1.15	1.4	1.05	.....
11	1.7	1.6	2.05	1.8	1.85	1.3	1.15	1.4	.....	.....
12	1.65	1.6	1.95	1.8	1.85	1.3	1.15	1.4	1.2	.....
13	1.6	1.6	1.95	1.8	1.85	1.3	1.15	1.2	1.2	.....
14	1.6	1.6	2.0	1.8	1.8	1.3	1.15	1.2	1.2	.....
15	1.6	1.5	2.05	1.8	1.8	1.3	1.1	1.1	1.15	.....
16	1.55	1.45	2.05	1.8	1.8	1.3	1.1	1.1	1.15	.....
17	1.5	1.45	2.05	1.8	1.75	1.3	1.1	1.1	1.15	.....
18	1.5	1.5	2.05	1.8	1.7	1.3	1.1	1.1	1.2	.....
19	1.6	1.5	2.05	1.8	1.7	1.3	1.1	1.1	1.3	.....
20	1.6	1.5	2.0	1.75	1.7	1.3	1.1	1.05	1.2	.....
21	1.6	1.5	2.0	1.75	1.6	1.3	1.1	1.05	1.25	.....
22	1.6	1.5	2.1	1.75	1.6	1.4	1.1	1.05	1.2	.....
23	1.6	1.6	2.2	1.75	1.6	1.35	1.1	1.05	1.2	.....
24	1.7	1.6	2.2	1.75	1.5	1.35	1.1	1.05	1.2	.....
25	1.75	1.65	2.15	1.75	1.5	1.3	1.1	1.05	1.2	.....
26	1.75	1.65	2.1	1.75	1.5	1.3	1.05	1.05	1.2	.....
27	1.7	1.65	2.05	1.75	1.7	1.3	1.1	1.05	1.15	.....
28	1.7	1.7	2.0	1.75	1.9	1.3	1.1	1.05	1.2	.....
29	1.7	.....	1.95	1.75	.....	1.25	1.1	1.35	1.2	.....
30	1.7	.....	1.95	1.8	1.75	1.25	1.05	1.3	1.15	.....
31	1.7	.....	1.95	.....	1.75	.....	1.05	1.35	.....	.....

Daily gage height, in feet, of Deschutes River at Bend, Oreg., for 1910—Continued.

[Gage at dam. C. A. Stanburrough, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	1.29	1.30	1.51	11	1.33	.....	1.60	21	1.33	1.48	1.45
2	1.30	1.30	1.55	12	1.35	1.60	1.55	22	1.34	.....	1.45
3	1.30	1.30	1.60	13	1.35	1.52	1.55	23	1.32	1.55	1.45
4	1.34	.....	1.65	14	1.33	1.55	1.55	24	1.30	1.60	1.45
5	1.35	.....	1.62	15	1.33	1.50	1.50	25	1.30	1.60	1.44
6	1.35	1.40	1.60	16	1.33	1.50	1.50	26	1.30	1.55	1.50
7	1.35	1.45	1.55	17	1.33	1.45	1.50	27	1.30	.....	1.50
8	1.35	1.58	1.55	18	1.33	1.50	1.50	28	1.30	1.50	1.45
9	1.35	.....	1.60	19	1.33	1.50	1.50	29	1.30	1.50	1.45
10	1.33	.....	1.59	20	1.33	1.42	1.45	30	1.30	1.50	1.45
								31	1.30	.....	1.45

Daily discharge, in second-feet, of Deschutes River at Bend, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,680	1,680	2,020	2,100	1,880	1,740	1,230	1,050	1,330	1,160	1,170	1,450
2	1,680	1,680	2,170	2,100	1,880	1,610	1,180	1,380	1,330	1,170	1,170	1,510
3	1,330	1,610	2,240	2,020	1,950	1,610	1,230	1,440	1,140	1,170	1,170	1,580
4	1,380	1,490	2,400	2,020	2,020	1,740	1,230	1,440	1,090	1,220	1,200	1,660
5	1,610	1,610	2,480	1,950	2,020	1,490	1,230	1,380	1,050	1,240	1,250	1,610
6	1,490	1,740	2,650	1,950	2,020	1,440	1,230	1,380	1,090	1,240	1,300	1,580
7	1,610	1,490	2,650	1,950	1,950	1,380	1,180	1,380	1,090	1,240	1,370	1,510
8	1,680	1,610	2,650	1,880	1,880	1,330	1,180	1,380	1,090	1,240	1,550	1,510
9	1,680	1,610	2,480	1,950	1,880	1,330	1,180	1,380	1,090	1,240	1,550	1,580
10	1,740	1,610	2,320	1,880	1,880	1,280	1,140	1,380	1,050	1,210	1,580	1,570
11	1,740	1,610	2,240	1,880	1,950	1,280	1,140	1,380	1,100	1,210	1,580	1,580
12	1,680	1,610	2,100	1,880	1,950	1,280	1,140	1,380	1,180	1,240	1,580	1,510
13	1,610	1,610	2,100	1,880	1,950	1,280	1,140	1,180	1,180	1,240	1,470	1,510
14	1,610	1,610	2,170	1,880	1,880	1,280	1,140	1,180	1,180	1,210	1,510	1,510
15	1,610	1,490	2,240	1,880	1,880	1,280	1,090	1,090	1,140	1,210	1,440	1,440
16	1,550	1,440	2,240	1,880	1,880	1,280	1,090	1,090	1,140	1,210	1,440	1,440
17	1,490	1,440	2,240	1,880	1,810	1,280	1,090	1,090	1,140	1,210	1,370	1,440
18	1,490	1,490	2,240	1,880	1,740	1,280	1,090	1,090	1,180	1,210	1,440	1,440
19	1,610	1,490	2,240	1,880	1,740	1,280	1,090	1,090	1,280	1,210	1,440	1,440
20	1,610	1,490	2,170	1,810	1,740	1,280	1,090	1,050	1,180	1,210	1,330	1,370
21	1,610	1,490	2,170	1,810	1,610	1,280	1,090	1,050	1,230	1,210	1,410	1,370
22	1,610	1,490	2,320	1,810	1,610	1,380	1,090	1,050	1,180	1,220	1,450	1,370
23	1,610	1,610	2,480	1,810	1,610	1,330	1,090	1,050	1,180	1,200	1,510	1,370
24	1,740	1,610	2,480	1,810	1,490	1,330	1,090	1,050	1,180	1,170	1,580	1,370
25	1,810	1,680	2,400	1,810	1,490	1,280	1,090	1,050	1,180	1,170	1,580	1,360
26	1,810	1,680	2,320	1,810	1,490	1,280	1,050	1,050	1,180	1,170	1,510	1,440
27	1,740	1,680	2,240	1,810	1,740	1,280	1,090	1,050	1,140	1,170	1,470	1,440
28	1,740	1,740	2,170	1,810	2,020	1,280	1,090	1,050	1,180	1,170	1,440	1,370
29	1,740	.....	2,100	1,810	1,900	1,230	1,090	1,330	1,180	1,170	1,440	1,370
30	1,740	.....	2,100	1,880	1,810	1,230	1,050	1,280	1,140	1,170	1,440	1,370
31	1,740	.....	2,100	.....	1,810	.....	1,050	1,330	.....	1,170	.....	1,370

NOTE.—Daily discharge Jan. 1 to Sept. 30 determined from readings of the gage at the pumping plant and a rating curve well defined between 1,200 and 2,100 second feet. Discharge Oct. 1 to Dec. 31 determined from readings of gage above the dam and a well-defined rating curve based on four discharge measurements in 1910 and 1911 and the weir formula.

Monthly discharge of Deschutes River at Bend, Oreg., for 1910.

[Drainage area, 1,530 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	1,810	1,330	1,640	1.07	1.23	101,000	A.
February	1,740	1,440	1,590	1.04	1.08	88,300	A.
March	2,650	2,020	2,290	1.50	1.73	141,000	A.
April	2,100	1,810	1,890	1.24	1.38	112,000	A.
May	2,020	1,490	1,720	1.12	1.29	106,000	A.
June	1,740	1,230	1,360	.889	.99	80,900	A.
July	1,230	1,050	1,130	.739	.85	69,500	A.
August	1,440	1,050	1,210	.791	.91	74,400	A.
September	1,330	1,050	1,160	.758	.85	69,000	A.
October	1,240	1,160	1,200	.784	.90	73,800	A.
November	1,580	1,170	1,420	.928	1.04	84,500	A.
December	1,660	1,360	1,470	.961	1.11	90,400	A.
The year	2,650	1,050	1,510	.987	13.36	1,090,000	

DESCHUTES RIVER AT LAIDLAW, OREG.

This station which is located at the old Laidlaw highway bridge in Laidlaw, Oreg., was established January 1, 1909. It is below all important diversions for irrigation. A short distance below the station the river enters a canyon which it follows to its mouth.

The vertical staff gage is attached to piling on the highway bridge. As no observer was available at the upper bridge location, it was found necessary to locate the gage at the lower bridge, where conditions for measurements are not good.

Discharge measurements are made from the new county bridge 1 mile upstream from the gage. At the measuring section the right bank is low, but is not liable to overflow. The left bank is high and rocky and is more or less covered with brush and willows. The bed of the stream is composed of gravel and is fairly permanent.

Below Laidlaw the stream is essentially a power stream, and above the conditions are favorable for diversion of water into irrigation canals.

Computations of discharge are withheld until more measurements are made. Gage readings prior to July are fragmentary and worthless.

Discharge measurements of Deschutes River at Laidlaw, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Feet.*	*Sec.-ft.*
Apr. 18	L. R. Allen	156	506	1.85	1,870
June 23	do	154	462	1.52	1,430
July 7	do	151	442	1.37	1,220
Sept. 17	Allen and Davenport	152	356	1.35	1,290
Sept. 19	do	202	407	1.35	1,280
Nov. 14	R. W. Davenport	156	416	1.65	1,770
Dec. 21	do	209	494	1.56	1,560
22[a]	do	214	486	1.57	1,560
22[b]	do	155	390	1.57	1,650
29[b]	do	156	390	1.57	1,620

[a] From highway bridge. [b] From bridge 1 mile above Laidlaw.

Daily gage height, in feet, of Deschutes River at Laidlaw, Oreg., for 1910.

[G. W. Horner, observer.]

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.50	1.45	1.35	1.38	1.60	16	1.32	1.30	1.32	1.40	1.65	1.60
2	.....	1.28	1.45	1.35	1.38	1.68	17	1.32	1.30	1.35	1.40	1.60	1.60
3	.....	1.28	1.35	1.35	1.38	1.75	18	1.32	1.30	1.35	1.40	1.60	1.60
4	.....	1.28	1.35	1.38	1.38	1.76	19	1.32	1.30	1.40	1.40	1.60	1.60
5	.....	1.50	1.30	1.40	1.38	1.76	20	1.30	1.30	1.50	1.40	1.60	1.60
6	.....	1.50	1.30	1.40	1.38	1.70	21	1.32	1.28	1.40	1.40	1.58	1.55
7	.....	1.50	1.30	1.42	1.38	1.68	22	1.32	1.28	1.40	1.40	1.60	1.58
8	1.38	1.50	1.30	1.42	.....	1.68	23	1.32	1.28	1.40	1.40	1.70	1.58
9	1.35	1.50	1.30	1.42	.....	1.68	24	1.32	1.28	1.40	1.40	1.72	1.58
10	1.35	1.50	1.30	1.40	1.65	1.68	25	1.32	1.25	1.40	1.40	1.70	1.60
11	1.35	1.50	1.28	1.40	1.70	1.68	26	1.30	1.25	1.38	1.40	1.70	1.60
12	1.35	1.50	1.30	1.40	1.70	1.68	27	1.30	1.25	1.35	1.40	1.68	1.60
13	1.35	1.45	1.30	1.40	1.60	1.65	28	1.30	1.25	1.35	1.38	1.70	1.60
14	1.35	1.35	1.30	1.40	1.65	1.63	29	1.30	1.45	1.35	1.38	1.60	1.60
15	1.35	1.30	1.32	1.40	1.65	1.60	30	1.30	1.45	1.35	1.35	1.60	1.58
							31	1.28	1.43	.....	1.38	.....	1.58

NOTE.—No record of any ice at this station.

DESCHUTES RIVER NEAR CLINE FALLS, OREG.

This station, which is located in sec. 13, T. 15 S., R. 12 E., 1 mile above Cline Falls, Oreg., about 12 miles below the mouth of Tumalo Creek and about 15 miles above the mouth of Squaw Creek, was established February 15, 1910, in cooperation with the Cline Falls Power Co.

Discharge measurements are made from a boat running on a cable at the gage. Conditions for measuring are excellent. Gage heights will never be affected by ice and the record may be considered excellent.

Discharge measurements of Deschutes River near Cline Falls, Oreg., for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 11	Allen and Davenport	121	467	0.75	984
19	do	175	503	.89	1,190
Nov. 9	R. W. Davenport	176	534	1.11	1,390
Dec. 21	do	176	514	.97	1.250

NOTE.—Measurements made from a boat.

Daily gage height, in feet, of Deschutes River near Cline Falls, Oreg., for 1910.

[I. L. Harader, observer.]

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	1.4	1.3	1.4	0.9	0.75	0.9	0.8	0.8	1.1
2	.....	1.6	1.4	1.35	1.2	.9	.75	.9	.75	.8	1.1
3	.....	1.6	1.4	1.35	1.15	.9	1.0	.8	.8	.8	1.15
4	.....	1.65	1.4	1.4	1.15	.9	1.0	.7	.85	.8	1.25
5	.....	1.7	1.4	1.4	1.1	.9	1.0	.7	.85	.85	1.25
6	.....	1.75	1.4	1.4	1.1	.9	1.0	.7	.85	.95	1.2
7	.....	1.8	1.35	1.4	1.05	.9	1.0	.7	.85	1.0	1.2
8	.....	1.75	1.35	1.35	1.0	.9	1.0	.7	.85	1.1	1.15
9	.....	1.7	1.35	1.35	1.0	.9	1.0	.7	.8	1.1	1.15
10	.....	1.6	1.35	1.35	1.0	.85	1.0	.7	.8	1.1	1.1
11	.....	1.5	1.35	1.35	1.0	.85	1.0	.7	.8	1.1	1.1
12	.....	1.5	1.35	1.35	1.0	.85	1.0	.7	.8	1.1	1.1
13	.....	1.5	1.35	1.35	1.0	.8	1.0	.75	.8	1.1	1.1
14	.....	1.55	1.35	1.35	1.0	.8	.9	.75	.8	1.15	1.1
15	1.15	1.55	1.35	1.35	1.0	.8	.85	.8	.8	1.15	1.1
16	1.2	1.55	1.3	1.35	1.0	.8	.8	.8	.8	1.1	1.1
17	1.25	1.55	1.3	1.35	1.0	.8	.75	.8	.8	1.05	1.1
18	1.25	1.6	1.3	1.3	.95	.8	.75	.85	.8	1.05	1.1
19	1.25	1.6	1.35	1.3	.95	.8	.7	.9	.8	1.05	1.1
20	1.25	1.55	1.35	1.3	.95	.8	.7	.85	.8	1.0	1.0
21	1.25	1.55	1.35	1.3	.95	.8	.7	.85	.8	1.0	1.0
22	1.25	1.6	1.35	1.25	1.05	.8	.7	.85	.8	1.1	1.0
23	1.25	1.6	1.35	1.25	1.05	.8	.7	.85	.8	1.2	1.0
24	1.25	1.65	1.35	1.2	.95	.8	.7	.8	.8	1.2	1.0
25	1.25	1.6	1.35	1.15	.95	.8	.7	.8	.8	1.2	1.05
26	1.25	1.55	1.35	1.1	1.0	.8	.7	.8	.8	1.2	1.05
27	1.2	1.5	1.35	1.1	1.0	.8	.7	.8	.8	1.15	1.05
28	1.2	1.5	1.35	1.45	1.0	.8	.7	.8	.8	1.2	1.0
29	.....	1.45	1.3	1.45	1.0	.75	.7	.8	.8	1.2	1.0
30	.....	1.45	1.3	1.45	.9	.75	.85	.8	.8	1.1	1.0
31	.....	1.4	.....	1.45	.....	.75	.80	.....	.8	.....	1.05

Daily discharge, in second-feet, of Deschutes River near Cline Falls, Oreg., for 1910.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,820	1,820	1,670	1,820	1,160	1,020	1,160	1,060	1,060	1,390
2	.....	2,140	1,820	1,740	1,530	1,160	1,020	1,160	1,020	1,060	1,390
3	.....	2,140	1,820	1,740	1,460	1,160	1,270	1,060	1,060	1,060	1,460
4	.....	2,220	1,820	1,820	1,460	1,160	1,270	974	1,110	1,060	1,600
5	.....	2,310	1,820	1,820	1,390	1,160	1,270	974	1,110	1,110	1,600
6	.....	2,400	1,820	1,820	1,390	1,160	1,270	974	1,110	1,220	1,530
7	.....	2,480	1,740	1,820	1,330	1,160	1,270	974	1,110	1,270	1,530
8	.....	2,400	1,740	1,740	1,270	1,160	1,270	974	1,110	1,390	1,460
9	.....	2,310	1,740	1,740	1,270	1,160	1,270	974	1,060	1,390	1,460
10	.....	2,140	1,740	1,740	1,270	1,110	1,270	974	1,060	1,390	1,390
11	.....	1,980	1,740	1,740	1,270	1,110	1,270	974	1,060	1,390	1,390
12	.....	1,980	1,740	1,740	1,270	1,110	1,270	974	1,060	1,390	1,390
13	.....	1,980	1,740	1,740	1,270	1,060	1,270	1,020	1,060	1,390	1,390
14	.....	2,060	1,740	1,740	1,270	1,060	1,160	1,020	1,060	1,460	1,390
15	1,460	2,060	1,740	1,740	1,270	1,060	1,110	1,060	1,060	1,460	1,390
16	1,530	2,060	1,670	1,740	1,270	1,060	1,060	1,060	1,060	1,390	1,390
17	1,600	2,060	1,670	1,740	1,270	1,060	1,020	1,060	1,060	1,330	1,390
18	1,600	2,140	1,670	1,670	1,220	1,060	1,020	1,110	1,060	1,330	1,390
19	1,600	2,140	1,740	1,670	1,220	1,060	974	1,100	1,060	1,330	1,390
20	1,600	2,060	1,740	1,670	1,220	1,060	974	1,110	1,060	1,270	1,270
21	1,600	2,060	1,740	1,670	1,220	1,060	974	1,110	1,060	1,270	1,270
22	1,600	2,140	1,740	1,600	1,330	1,060	974	1,110	1,060	1,390	1,270
23	1,600	2,140	1,740	1,600	1,330	1,060	974	1,110	1,060	1,530	1,270
24	1,600	2,220	1,740	1,530	1,220	1,060	974	1,060	1,060	1,530	1,270
25	1,600	2,140	1,740	1,460	1,220	1,060	974	1,060	1,060	1,530	1,330
26	1,600	2,060	1,740	1,390	1,270	1,060	974	1,060	1,060	1,530	1,330
27	1,530	1,980	1,740	1,390	1,270	1,060	974	1,060	1,060	1,460	1,330
28	1,530	1,980	1,740	1,900	1,270	1,050	974	1,060	1,060	1,530	1,270
29	.....	1,900	1,670	1,900	1,270	1,020	974	1,060	1,060	1,530	1,270
30	.....	1,900	1,670	1,900	1,160	1,020	1,110	1,060	1,060	1,390	1,270
31	.....	1,820	.....	1,900	.....	1,020	1,060	.....	1,060	.....	1,330

NOTE.—Daily discharge determined from a rating curve well defined between 950 and 1,400 second-feet.

Monthly discharge of Deschutes River near Cline Falls, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
February 15-28	1,600	1,460	1,580	43,900	B.
March	2,480	1,820	2,100	129,000	B.
April	1,820	1,670	1,740	104,000	B.
May	1,900	1,390	1,710	105,000	B.
June	1,820	1,160	1,310	78,000	A.
July	1,160	1,020	1,090	67,000	A.
August	1,270	974	1,110	68,200	A.
September	1,160	974	1,050	62,500	A.
October	1,110	1,020	1,070	65,800	A.
November	1,530	1,060	1,350	80,300	A.
December	1,600	1,270	1,380	84,800	A.
The period				888,000	

DESCHUTES RIVER NEAR BIGGS, OREG.

This station, which was originally established October 19, 1897, at the Free Bridge near Moro, was reestablished July 22, 1906, at Taylor's ranch, in sec. 35, T. 2 N., R. 15 E., about 5 miles southwest of Biggs, Oreg., 1½ miles above the bridge of the Oregon-Washington Railroad & Navigation Co., at the mouth of the stream, and about 1 mile above Moody's toll bridge.

The records at this point show the amount of water discharged by Deschutes River into Columbia River and are directly comparable with those obtained at Free Bridge near Moro from 1897 to 1899, although the conditions at the earlier station are not nearly so favorable for accurate results as are those at the present site.

The gage is in two sections—the upper vertical and the lower inclined. Discharge measurements are made from a cable about 450 feet above the gage. A good rating curve has been obtained. The gage-height record during 1910 was very fragmentary, but estimates of flow have been made by filling in gaps by comparison with stations on upper Deschutes and Metolius rivers.

Discharge measurements of Deschutes River near Biggs, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section,	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Feet.*	*Sec.-ft.*
Mar. 10	L. R. Allen	445	2,400	4.40	13,600
July 27	Ebert and Davenport	445	1,530	2.36	5,170

Daily gage height, in feet, of Deschutes River near Biggs, Oreg., for 1910.

[Taylor and Arnold, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			6.65	3.45								
2	3.2		6.85	3.4								
3			6.7									
4	3.2		6.3									
5			5.8									
6	3.2											
7												
8	3.2											
9	3.2											
10												
11	3.35											
12												
13	3.45											
14												
15	3.6											
16												
17	3.5											
18												
19	3.5											
20		2.9										
21	3.45											2.7
22	3.45	2.9										
23	4.0											
24		3.1										
25	5.3	4.2								2.38		
26	4.2	4.65										
27		4.2					2.36					
28	3.0	4.15	3.6							2.34		
29	3.0											
30			3.5								2.95	2.7
31												

NOTE.—Gage reading reported to have been 2.30 feet during months of August and September, by S. W. Arnold, an engineer, who read it occasionally.

Daily discharge, in second-feet, of Deschutes River near Biggs, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr.
1	8,200	7,400	25,700	9,210	16	9,640	7,200	12,400	
2	8,200	7,400	26,900	9,000	17	9,420	7,100	12,200	
3	8,200	7,400	26,000		18	9,420	7,100	12,000	
4	8,200	7,400	23,800		19	9,420	7,100	11,800	
5	8,200	7,400	21,100		20	9,320	7,040	11,600	
6	8,200	7,300	19,600		21	9,210	7,040	11,400	
7	8,200	7,300	18,100		22	9,210	7,040	11,200	
8	8,200	7,300	16,600		23	11,700	7,420	11,000	
9	8,200	7,300	15,100		24	15,000	7,800	10,800	
10	8,500	7,300	13,600		25	18,400	12,700	10,500	
11	8,800	7,200	13,400		26	12,700	15,000	10,200	
12	9,000	7,200	13,200		27	10,000	12,700	10,000	
13	9,210	7,200	13,000		28	7,420	12,400	9,860	
14	9,740	7,200	12,800		29	7,420		9,630	
15	9,860	7,200	12,600		30	7,400		9,420	
					31	7,400		9,320	

Monthly discharge of Deschutes River near Biggs, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	18,400	7,400	9,420	579,000	B.
February	15,000	7,040	8,110	450,000	B.
March	26,900	9,320	14,300	879,000	B.
April			8,740	520,000	B.
May			7,960	489,000	B.
June			6,320	376,000	B.
July			5,400	332,000	B.
August			5,180	319,000	B.
September			5,230	311,000	B.
October			5,290	325,000	B.
November			6,300	375,000	B.
December			6,820	419,000	B.
The year			7,430	5,370,000	

NOTE.—The monthly means for April to December were obtained from comparisons with the discharge of upper Deschutes River and its tributaries. The results obtained in different ways are so consistent that the results can not be much in error.

EAST FORK OF DESCHUTES RIVER AT CRESCENT, OREG.

This station, which is located in the SW. ¼ sec. 30, T. 24 S., R. 9 E., at Crescent, Oreg., about 5 miles above the junction of East Fork with Deschutes River, was established December 25, 1904, discontinued March 31, 1908, and reestablished in cooperation with the United States Forest Service September 22, 1910.

No important ditches divert water above this point. The drainage area above the station is 196 square miles.

On December 24, 1910, the gage was moved from its original position to another part of the same bridge. The gage was installed, however, with the same datum as that previously used, and the record should be comparable with that obtained in the former site.

Discharge measurements are made from a bridge at the gage or during low water by wading in the vicinity of the gage.

Gage heights are somewhat affected during the winter months by ice, but by use of comparisons fair estimates of the flow during these periods may be secured.

The conditions for measuring are not very favorable, but the record for 1910 may be considered good.

Discharge measurements of East Fork of Deschutes River at Crescent, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 23	Allen and Davenport	24	30.6	2.22	33.2
Nov. 19[a]	R. W. Davenport	24	32	2.23	38.4
20[b]	do	21	24	2.21	32
Dec. 24[c]	do	26	34.7	2.50	41.7

[a] Measurement made from regular bridge.
[b] Measurement made by wading.
[c] Ice from 2 inches to 3 inches thick.

Daily gage height, in feet, and discharge, in second-feet, of East Fork of Deschutes River at Crescent, Oreg., for 1910.

[W. J. Nichols, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.2	32	2.2	32	2.9	81
2			2.2	32	2.2	32	2.7	64
3			2.2	32	2.2	32	2.6	56
4			2.6	56	2.2	32	2.7	64
5			2.5	49	2.2	32	2.6	56
6			2.5	49	2.2	32	2.9	81
7			2.5	49	3.3	121	2.7	64
8			2.3	37	3.3	121	2.4	43
9			2.5	49	3.3	121	3.2	110
10			2.2	32	2.55	52	2.8	72
11			2.2	32	2.45	46	2.7	64
12			2.2	32	2.4	43	2.6	56
13			2.2	32	2.3	37	2.5	49
14			2.2	32	2.3	37	2.5	49
15			2.2	32	2.3	37	2.4	43
16			2.2	32	2.2	32	2.7	64
17			2.5	49	2.2	32	2.8	72
18			2.2	32	2.3	37	2.7	64
19			2.2	32	2.4	43	2.6	56
20			2.2	32	2.6	56	2.5	49
21			2.2	32	2.5	49	2.5	49
22			2.2	32	2.6	56	2.6	46
23			2.2	32	2.5	49	2.6	46
24			2.2	32	2.5	49	2.6	46
25	2.2	32	2.2	32	2.4	43	2.6	46
26	2.2	32	2.2	32	2.4	43	2.6	46
27	2.2	32	2.2	32	2.6	56	2.6	46
28	2.1	27	2.2	32	2.4	43	2.6	46
29	2.2	32	2.2	32	2.6	56	2.6	46
30	2.2	32	2.2	32	2.7	64	2.6	46
31			2.2	32			2.6	46

NOTE.—River frozen over Dec. 22 to 31.
Daily discharge determined from a fairly well-defined rating curve. Discharge Dec. 22 to 31 reduced because of ice.

Monthly discharge of East Fork of Deschutes River at Crescent, Oreg., for 1910.

[Drainage area, 196 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches over drainage area.	Total in acre-feet.	
October	56	32	35.7	0.182	0.21	2,200	B.
November	121	32	50.5	.258	.29	3,000	B.
December	110	43	57.0	.291	.34	3,500	B.

WEST FORK OF DESCHUTES RIVER[1] NEAR LAPINE, OREG.

This station, which is located in sec. 26, T. 20 S., R. 20 E., at the National Forest highway bridge, 11 miles north of Lapine, Oreg., and about 4 miles above the mouth of West Fork, was established

[1] This river is known locally as Big River.

September 21, 1910, in cooperation with the United States Forest Service.

No important ditches divert water for irrigation above the station.

Discharge measurements are made from the upper side of the highway bridge to which the gage is attached.

A good rating curve has been obtained, but the gage height record is somewhat fragmentary and no estimate of flow is possible.

Discharge measurements of West Fork of Deschutes River near Lapine, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 21	Allen and Davenport	120	512	1.50	1,110
Nov. 18	R. W. Davenport	119	470	1.16	1,000
Dec. 26	do	118	440	.96	951

Daily gage height, in feet, of West Fork of Deschutes River near Lapine, Oreg., for 1910.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1					16				1.10
2				1.25	17				1.10
3				1.42	18				
4		1.55		1.41	19				1.05
5		1.45		1.32	20				
6				1.25	21				1.00
7				1.22	22	1.45			
8					23	1.45			
9				1.20	24				
10				1.20	25		1.25	1.25	
11					26		1.18	1.18	
12				1.18	27	1.41			
13				1.15	28	1.40			
14				1.12	29	1.40		1.35	
15				1.10	30	1.40		1.40	
					31				

WEST FORK OF DESCHUTES RIVER NEAR LAVA, OREG.

This station, which is located on the ranch of Joseph Whitfield, in the NE. ¼ NE. ¼ sec. 24, T. 20 S., R. 10 E., 1½ miles west of Lava, Oreg., and about the same distance above the junction of West Fork with Deschutes River, was established February 26, 1905, discontinued March 31, 1907, and reestablished at the same place April 23, 1909. A discharge measurement [1] was made, however, on March 28, 1908.

The inclined staff gage is located on the right bank above the cable from which discharge measurements are made.

Ice affects the flow past the station during the winter to some extent. In the summer a growth of weeds in the river bed causes backwater at the gage.

Estimates of discharge are withheld pending further study.

[1] See Water-Supply Paper U. S. Geol. Survey No. 252, p. 318.

Discharge measurements of West Fork of Deschutes River near Lava, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 26	L. R. Allen	101	550	9.24	1,130
June 21	do	101	539	9.03	1,160
Sept. 21	Allen and Davenport	101	536	8.74	1,090
Nov. 18	R. W. Davenport	101	497	8.37	1,040
Dec. 26	do	99	471	8.15	950

Daily gage height, in feet, of West Fork of Deschutes River near Lava, Oreg., for 1910.

[J. B. Heyburn, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.7	8.5	8.95	9.1	9.3	9.2	9.0	8.9	8.8	8.6	8.35	8.6
2	9.0	8.5	9.15	9.1	9.3	9.1	9.0	8.9	8.8	.....	8.35	8.7
3	10.5	9.65	9.2	9.2	9.4	9.1	9.0	8.9	8.8	.....	8.35	8.7
4	11.0	11.4	9.25	9.2	9.45	9.1	9.0	8.9	8.7	.....	8.35	8.7
5	11.3	10.65	9.4	9.15	9.4	9.1	9.0	8.9	8.7	.....	8.35	8.6
6	11.3	8.5	9.4	9.1	9.3	9.1	9.0	8.9	8.7	8.6	8.35	8.5
7	11.6	8.5	9.4	9.05	9.3	9.1	8.95	8.9	8.7	8.6	8.35	8.5
8	11.8	8.5	9.3	9.05	9.3	9.1	8.95	8.9	8.7	8.6	8.6	8.5
9	11.5	8.5	9.3	9.05	9.3	9.0	8.95	8.9	8.7	8.6	8.55	8.5
10	10.95	8.5	9.3	9.05	9.5	9.0	8.95	8.9	8.7	8.5	8.5	8.5
11	9.3	8.5	9.2	9.05	9.5	9.1	8.95	8.9	8.7	8.5	8.45	8.5
12	8.5	8.4	9.2	9.05	9.45	9.1	8.95	8.9	8.7	8.5	8.45	8.45
13	8.5	8.4	9.2	9.05	9.45	9.05	8.95	8.9	8.7	8.5	8.45	8.45
14	8.5	8.4	9.3	9.05	9.4	9.05	8.95	8.8	8.7	8.5	8.4	8.4
15	8.5	8.4	9.3	9.05	9.35	9.05	8.95	8.8	8.7	8.5	8.35	8.35
16	8.5	8.4	9.3	9.05	9.35	9.05	8.95	8.8	8.7	8.5	8.3	8.3
17	8.5	8.4	9.3	9.1	9.3	9.05	8.95	8.8	8.7	8.5	8.35	8.3
18	8.5	8.4	9.3	9.1	9.3	9.05	8.95	8.8	8.7	8.5	8.35	8.3
19	8.5	8.4	9.3	9.1	9.25	9.05	8.95	8.8	8.7	8.5	8.35	8.3
20	8.5	8.4	9.3	9.15	9.2	9.05	8.95	8.8	8.7	8.45	8.35	8.2
21	8.5	8.4	9.3	9.15	9.2	9.05	8.95	8.8	8.7	8.45	8.5	8.2
22	8.5	8.4	9.3	9.2	9.2	9.05	8.95	8.8	8.7	8.45	8.5	8.2
23	8.5	8.4	9.3	9.2	9.2	9.05	8.95	8.8	8.7	8.45	8.65	8.2
24	8.5	8.4	9.4	9.2	9.2	9.05	8.95	8.8	8.7	8.45	8.6	8.2
25	8.5	8.4	9.35	9.2	9.2	9.05	8.9	8.8	8.6	8.45	8.55	8.2
26	8.5	8.4	9.3	9.25	9.2	9.0	8.9	8.8	8.6	8.4	8.55	8.2
27	8.5	8.5	9.2	9.3	9.2	9.0	8.9	8.8	8.6	8.4	8.5	8.2
28	8.5	8.6	9.2	9.3	9.2	9.0	8.9	8.8	8.6	8.4	8.4	8.2
29	8.5	.....	9.15	9.3	9.2	9.0	8.9	8.8	8.6	8.4	8.6	8.2
30	8.5	.....	9.1	9.3	9.2	8.95	8.9	8.8	8.6	8.4	8.7	8.2
31	8.5	.....	9.1	.....	9.2	.....	8.9	8.8	.....	8.35	.....	8.2

NOTE.—Ice jam at county bridge below the forks caused backwater at the station Jan. 3 to 10 and Feb. 3 to 5. Backwater may also be caused occasionally by slush ice.

TUMALO CREEK BASIN.

Tumalo Creek rises on Ball Butte in the southwestern part of Crook County, Oreg., and flows in a general easterly course to its junction with Deschutes River, about 4 miles south of Laidlaw.

The Columbia Southern Irrigation Co. selected about 27,000 acres of land for development under the terms of the Carey Act. Land with water rights was sold to settlers, and construction of canals was begun before any knowledge was obtained of the flow of the stream. Later it was found that the water was not sufficient for more than about one-third of the land and considerable litigation followed.

TUMALO CREEK NEAR LAIDLAW, OREG.

This gaging station, which is located 1½ miles above the intake of the Columbia Southern canal and 300 feet above the Wimer ditch,[a] was first established May 15, 1906, one-half mile above the head gate of the Columbia Southern canal in sec. 2, T. 18 S., R. 10 E. At this point, which has been referred to as the Laidlaw station, records were obtained during the irrigation season only, observations being furnished by the patrolman in the employ of the irrigation company. During the winter no patrolman was kept at the headgates, and a substitute station was kept at a bridge on the Bend-Sisters road, 6 miles downstream, known as the Bend station. As first located the station was below the intake of the Wimer ditch and during the period from May 15, 1906, to April 1, 1908, the flow in Wimer ditch should be added to that in Tumalo Creek to obtain the natural flow at this point.

The station was removed to the present site April 1, 1908.

Gages at the new station are not comparable with those at the old.

The records of gage height are furnished without cost to the Survey by the Columbia Southern Irrigation Co.

Discharge measurements of Tumalo Creek near Laidlaw and Bend, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	L. R. Allen	38	14	3.95	178
June 22	do	37	60.8	3.70	119
Sept. 17	Allen and Davenport	36	53	3.49	77
Nov. 15	R. W. Davenport	36	57	3.54	86
15[b]	do	28	45	1.44	77

[a] See descriptions of stations on these canals, pp. 505-506. [b] At lower or Bend station.

Daily gage height, in feet, and discharge, in second-feet, of Tumalo Creek near Laidlaw, Oreg., for 1910.

[Fred N. Wallace, observer.]

Day.	Apr.		May.		June.		July.		Aug.		Sept.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.88	161	4.22	249	3.70	119	3.51	81	3.49	78
2				158	4.08	212	3.70	119	3.51	81	3.49	78
3			3.85	154	4.00	191	3.65	108	3.51	81	3.49	78
4			3.80	142	3.95	178	3.63	104	3.51	81	3.49	78
5			3.78	136	4.09	214	3.65	108	3.51	81	3.49	78
6			3.79	140	3.95	178	3.78	137	3.50	79	3.49	78
7			3.88	161	3.91	168	3.68	115	3.51	81	3.48	76
8			4.11	220	3.85	154	3.68	115	3.50	79	3.48	76
9			4.11	220	3.85	154	3.80	142	3.51	81	3.48	76
10			4.22	249	3.91	168	3.70	119	3.50	79	3.48	76
11			4.10	217	4.21	247	3.70	119	3.51	81	3.48	76
12			4.12	222	4.00	191	3.68	115	3.50	79		
13			4.08	212	3.95	178	3.64	106	3.50	79		
14			4.05	204	3.87	159	3.62	102	3.50	79		
15			4.00	191	3.87	159	3.60	98	3.50	79		
16			3.94	176	4.12	222	3.60	98	3.49	78		
17			3.93	174	3.88	161	3.59	96	3.49	78	3.49	78
18			4.00	191	3.88	161	3.59	96	3.49	78		
19			4.00	191	3.89	164	3.59	96	3.50	79		
20	3.96	181	3.95	178	3.78	138	3.60	98	3.50	79	3.59	96
21	3.90	166	3.98	186	3.70	119	3.59	96	3.50	79		
22	3.93	174	4.00	191	3.70	119	3.59	96	3.50	79		
23	4.00	191	4.09	214	3.66	111	3.60	98	3.50	79	3.49	78
24	4.10	217	4.20	244	3.67	112	3.58	94	3.49	78		
25		244	4.15	230	3.70	119	3.57	92	3.49	78		
26	4.29	268	4.10	217	3.72	124	3.56	90	3.49	78		
27	4.11	220	4.09	214	3.72	124	3.55	88	3.49	78		
28	4.09	214	3.99	188	3.71	121	3.54	87	3.49	78		
29	4.00	191	4.12	222	3.70	119	3.54	87	3.48	76		
30	3.92	171	4.15	230	3.70	119	3.53	85	3.48	76		
31			4.20	244			3.52	83	3.48	76		

NOTE.—Gage readings at this station apparently not affected by ice.
Daily discharge determined from a rating curve well defined below about 200 second-feet.

Daily gage height, in feet, of Tumalo Creek near Bend, Oreg., for 1910.

[F. N. Wallace, observer.]

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1			11		1.65	21		
2			12			22		
3	1.32		13	1.40		23		
4			14			24		
5			15	1.44		25		
6			16			26		
7			17		1.72	27		1.50
8			18			28		
9			19			29		
10			20			30	1.45	
						31		

Monthly discharge of Tumalo Creek near Laidlaw, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 20-30	268	166	203	4,430	B.
May	249	136	196	12,100	B.
June	249	111	161	9,580	B.
July	142	83	103	6,330	A.
August	81	76	79.0	4,860	A.
September	.....	.....	[a] 80.	4,760	B.

[a] Monthly mean estimated.

SQUAW CREEK BASIN.

Squaw Creek rises in the Cascade Range in the southwestern part of Crook County, Oreg., and flows northeastward to its junction with Deschutes River. Its waters are used extensively for irrigation in small ditches. Segregations of large areas of land have been made for reclamation under the provisions of the Carey Act to be irrigated from this creek.

SQUAW CREEK AND McALLISTER'S DITCH NEAR SISTERS, OREG.

The station on Squaw Creek was established June 15, 1906. It is located 4 miles south of Sisters and above all present ditches except McAllister's ditch. McAllister's ditch heads a short distance above the station, and the amount diverted in this ditch should be added to that measured in the creek in order to determine the natural flow of the stream at this point.

The vertical staff gage on the creek is located on the right bank about 50 feet below a foot log used in making discharge measurements. The station on the ditch is located just above the wasteway gate. Measurements are made from cross timbers on the upstream side of this wasteway.

A short distance below the station a dam has been constructed to divert water into the Burkhardt lateral of the Squaw Creek Irrigation Co. This has been altered by freshets and washed away in the fall, and on this account the records of flow are not so reliable as could be desired.

Since the fall flood of November, 1909, the dam has been rebuilt fairly solidly with rocks and cribwork, and it is likely that no material change will occur except in unusually high water or an ice flood such as sometimes comes down Squaw Creek.

Computations of discharge for 1910 are withheld until more measurements can be made.

Discharge measurements of Squaw Creek near Sisters, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 23	L. R. Allen	29	40	3.39	136
June 29	do	29	40	3.43	142
Sept. 16	Allen and Davenport	28	28	3.05	68
Nov. 12	R. W. Davenport	29	36	3.24	97

Daily gage height, in feet, of Squaw Creek near Sisters, Oreg., for 1910.

[S. Wiehl, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.15	3.2	3.85	3.15	3.4	3.95	3.5	3.35	3.15	3.05	2.9	3.2
2	3.3	3.15	3.65	3.15	3.3	3.8	3.45	3.3	3.15	3.0	2.9	3.25
3	3.5	3.2	3.6	3.15	3.3	3.7	3.45	3.3	3.5	3.8	2.9	3.25
4	4.2	3.2	3.5	3.1	3.25	3.75	.....	3.3	3.35	3.45	2.85	3.3
5	4.95	3.3	3.4	3.1	3.25	3.7	3.45	3.3	3.2	3.25	2.85	3.25
6	4.9	3.2	3.35	3.1	3.3	3.7	3.5	3.3	3.1	3.2	2.85	3.25
7	4.8	3.15	3.3	3.15	3.35	3.6	3.7	3.3	3.1	3.2	2.9	3.2
8	4.7	3.1	3.3	3.2	3.45	3.5	3.6	3.4	3.05	3.15	3.75	3.2
9	4.6	3.1	3.3	3.2	3.55	3.55	3.6	3.3	.....	3.1	4.0	3.15
10	4.6	3.1	3.25	3.2	3.7	3.65	3.6	3.3	3.05	3.1	3.8	3.15
11	4.6	3.05	3.25	3.2	3.55	4.0	3.65	3.3	3.05	3.1	3.45	3.1
12	4.4	3.05	3.25	3.2	3.55	3.75	3.65	3.3	3.0	3.15	3.3	3.1
13	3.2	3.1	3.3	3.2	3.55	3.6	3.6	3.3	3.0	3.1	3.25	3.1
14	3.1	3.1	3.35	3.15	3.55	3.6	3.6	3.3	3.0	3.0	3.2	3.1
15	3.1	3.1	3.3	3.15	3.5	3.65	3.6	3.25	3.0	3.0	3.15	3.1
16	3.05	3.1	3.3	3.15	3.6	3.8	3.6	3.2	3.0	3.0	3.1	3.05
17	3.05	3.05	3.3	3.2	3.45	3.6	3.6	3.2	3.0	3.1	3.05	3.05
18	3.1	3.0	3.4	3.3	3.5	3.6	3.6	3.2	3.0	3.15	3.05	3.05
19	3.15	3.0	3.35	3.5	3.5	3.55	3.6	3.25	3.05	3.1	3.05	3.1
20	3.15	3.0	3.3	3.4	3.7	3.5	3.55	3.25	3.45	3.05	3.05	3.1
21	3.15	3.05	3.3	3.4	3.5	3.4	3.55	3.25	3.5	3.0	3.4	3.1
22	3.3	3.3	3.3	3.5	3.6	3.4	3.5	3.25	3.6	3.0	3.35	3.05
23	3.5	3.0	3.25	3.4	3.7	3.35	3.5	3.2	3.3	3.0	3.25	3.05
24	3.4	3.0	3.2	3.5	3.9	3.35	3.5	3.2	3.1	3.0	3.15	3.05
25	3.2	2.95	3.2	3.55	3.75	3.6	3.5	3.2	3.15	3.0	3.1	3.05
26	3.2	2.95	3.2	3.55	3.7	3.5	3.45	3.2	3.25	2.95	3.1	3.1
27	3.2	3.0	3.25	3.5	3.65	3.5	3.45	3.2	3.1	2.95	3.15	3.1
28	3.15	3.05	3.2	3.5	3.65	3.5	3.4	3.15	3.05	2.95	3.3	3.1
29	3.15	.....	3.15	3.45	3.7	3.5	3.4	3.1	3.1	2.95	3.3	3.0
30	3.15	.....	3.15	3.45	4.0	3.5	3.4	3.1	3.15	2.95	3.2	3.0
31	3.15	.....	3.15	.....	3.85	.....	3.4	3.15	.....	2.95	.....	3.0

NOTE.—Squaw Creek does not freeze over but the gage readings are occasionally affected during the winter by shore and anchor ice. The rise in gage heights Jan. 2 to 13 and that of Feb. 22 were evidently due to this cause.

Discharge measurements of McAllister's ditch near Sisters, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 29	L. R. Allen	7.6	11	1.31	13.7
Sept. 16	Allen and Davenport	7.6	7.5	.92	[a] 6.2
Nov. 12	R. W. Davenport	7	5.3	1.01	4.2

Daily gage height, in feet, of McAllister's ditch near Sisters, Oreg., for 1910.

[S. Wiehl, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.3	1.25	1.05	0.9	0.9	0.8	16	.....	1.4	1.1	0.9	0.9	0.9	0.8
2	.....	1.3	1.2	1.05	.9	.9	.85	17	.....	1.4	1.1	.9	.95	.9	.8
3	.....	1.3	1.2	1.3	1.5	.9	.85	18	.....	1.4	1.1	1.0	1.0	.9	.8
4	.....	.....	1.2	1.2	1.3	.85	.9	19	.....	1.4	1.2	1.0	1.0	.9	.95
5	.....	1.3	1.2	1.1	1.2	.85	.8	20	.....	1.35	1.2	1.3	1.0	.9	.95
6	.....	1.4	1.2	1.0	1.15	.85	.8	21	.....	1.35	1.15	1.15	.9	.9	.95
7	.....	1.5	1.2	1.0	1.1	.9	.8	22	.....	1.35	1.15	1.0	.95	.9	.95
8	.....	1.45	1.25	.95	1.05	1.1	.8	23	.....	1.3	1.1	1.0	.95	.9	.95
9	.....	1.4	1.2	.....	1.0	1.2	.8	24	.....	1.3	1.1	1.0	.95	.9	.95
10	.....	1.4	1.2	.95	1.0	1.15	.8	25	.....	1.3	1.1	1.0	.95	.9	.95
11	.....	1.4	1.2	.95	1.0	1.05	.8	26	.....	1.3	1.1	1.15	.9	.9	1.1
12	.....	1.4	1.2	.9	1.05	1.0	.8	27	.....	1.3	1.1	1.05	.95	.9	1.1
13	.....	1.4	1.2	.9	1.0	1.0	.8	28	.....	1.3	1.05	.9	.95	.85	1.1
14	.....	1.4	1.2	.9	.9	.95	.8	29	1.3	1.3	1.0	1.0	.9	.8	.85
15	.....	1.4	1.15	.9	.9	.95	.8	30	1.35	1.3	1.0	1.1	.95	.8	.8
								31	.....	1.3	1.05	.....	.95	.....	.8

CROOKED RIVER BASIN.

GENERAL FEATURES.

Crooked River, the principal tributary of Deschutes River from the east, rises in the Blue Mountains in the eastern part of Crook County, Oreg., is about 125 miles long, and drains a total area of about 2,920 square miles. The principal tributaries are Bear, Beaver, and Ochoco creeks.

The river flows through a narrow valley, in some places a mere gorge and in others opening out to a width of more than a mile. The topography of the basin is varied and picturesque. For about 25 miles above the mouth the contiguous table land is rolling and is covered with a sparse growth of juniper. Above this point the surface is more broken, and low hills rise rapidly to lofty mountains covered with a heavy growth of pine timber. The prominent topographic features are the abrupt rim rocks along the watercourses and the deeply eroded sides of the mountains that rise above the lava flow. Altitudes range from 2,500 feet to 6,000 feet above sea level. The principal rocks of the region are basaltic lava, sandstone, and allied sedimentary rocks and some dikes of a porphyritic material, and these rocks disintegrated make up the soil.

Approximately 20 per cent of the drainage area is forested with pine timber. The annual rainfall at Prineville is about 9 inches, but it is much greater in the higher altitudes. As this precipitation is well distributed throughout the year some crops can be raised without irrigation, but no successful general agriculture is possible without irrigation.

Although nearly the entire flow of the stream is used for irrigation during the irrigating season, no effort has been made to store the flood water of the river in order to increase the summer flow. In addition to the reservoir site at Stewart's grade, about 12 miles above Post, there are many other places along the river where dams could be constructed and water stored for irrigation and power development, the most important site being at Summit Prairie, on the North Fork.

CROOKED RIVER NEAR POST, OREG.

This station, which is located at Stewart's grade, in the deep canyon 12 miles above Post and about one-half mile below the mouth of North Fork of Crooked River, at a proposed site for a dam that will impound a large amount of water for irrigation, was established November 9, 1908.

The staff gage is on the right bank at the cable from which discharge measurements are made. On October 22, 1909, the gage datum was lowered 1 foot and all 1909 readings were corrected to the new datum. The gage heights for 1908, published in Water-Supply Paper 252, page 327, should be increased 1 foot to be comparable with the 1909 gage heights.

Results at this station are not so good as desired, on account of the roughness of the measuring section and the pulsating water at the gage. The records for 1909 as published in Water-Supply Paper 272, pages 395–396, are believed, in the light of later measurements, to have been considerably in error; they have been recomputed and the revised figures are presented herewith.

Discharge measurements of Crooked River near Post, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 8	L. R. Allen	89	288	3.50	751
May 31 [a]	Stevens and Allen	29	37	.76	35
Nov. 2 [a]	R. W. Davenport	35	48	.94	48
Dec. 6	do	75	176	2.06	284

[a] Made by wading.

Daily gage height, in feet, of Crooked River near Post, Oreg., for 1910.

[E. A. Stewart, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.25	3.00	10.00	3.85	1.88	.....	.....	0.54	0.45	0.80	0.92	3.00
2	2.25	2.80	8.70	3.90	1.95	.....	.....	.53	.45	.80	.95	2.85
3	2.25	2.50	8.00	3.55	2.00	0.63	.....	.52	.46	.80	.95	3.35
4	2.25	2.20	7.00	3.30	2.50	.63	.....	.52	.....	.80	.95	.....
5	2.25	2.20	6.80	3.40	2.20	.60	.....	.50	.....	.82	.98	.....
6	2.25	2.15	5.60	3.60	1.90	.57	.....	.50	.....	.85	1.00	.....
7	2.25	2.10	5.40	3.50	1.90	.55	.....	.49	.....	.86	1.08	.....
8	2.25	2.10	5.40	3.60	1.90	.50	.....	.48	.....	.90	1.22	.....
9	2.25	2.10	5.40	.....	1.95	.48	.....	.47	.....	.92	1.22	.....
10	2.25	2.10	5.20	3.70	1.95	.50	0.50	.47	.58	.93	1.21	.....
11	2.25	2.15	5.30	3.55	1.88	.55	.50	.46	.62	.....	1.20	3.15
12	2.25	2.20	5.60	3.55	1.80	.....	.50	.46	.65	.....	1.25	3.30
13	2.25	3.60	5.80	3.45	1.77	.....	.50	.45	.70	.....	1.22	3.65
14	2.25	4.55	6.00	3.00	1.70	.....	.50	.43	.76	1.00	1.19	.....
15	2.25	3.00	6.20	.....	1.60	.....	.52	.43	.78	.98	1.16	1.40
16	2.25	2.80	6.30	2.90	1.50	.....	.52	.42	.85	.97	1.15	1.00
17	2.25	2.60	6.40	2.90	1.20	.40	.50	.42	.88	.....	1.13	.85
18	2.25	.....	6.30	2.90	1.17	.40	.52	.40	.90	.....	1.11	.60
19	2.25	2.00	6.80	2.90	1.18	.40	.52	.40	.87	.91	1.11	.70
20	2.30	2.00	6.70	2.85	1.00	.40	.65	.40	.84	.91	1.28	.80
21	2.40	1.90	6.00	2.70	.95	.40	.70	.40	.80	.90	.....	.95
22	3.80	1.90	6.30	2.65	1.00	.50	.85	.40	.80	.90	1.80	1.10
23	5.60	1.90	6.15	2.40	.90	.60	.80	.40	.80	.90	.....	1.20
24	6.21	4.45	5.30	2.30	.90	.60	.70	.40	.79	.91	.....	1.40
25	3.20	6.00	5.00	2.25	.98	.60	.60	.41	.79	.91	1.65	1.60
26	2.68	5.40	4.40	2.25	.88	.60	.58	.41	.78	.90	1.50	1.70
27	2.66	6.15	.....	2.10	.85	.59	.57	.41	.78	.90	.....	2.00
28	2.70	8.00	4.00	2.00	.95	.58	.55	.41	.79	.89	.....	2.20
29	2.55	.....	3.70	1.88	.....	.56	.55	.42	.80	.89	.....	2.37
30	2.60	.....	3.55	1.88	.....	.55	.54	.44	.80	.89	3.20	2.50
31	4.40	.....	3.65	.....	.....	.....	.54	.44	.....	.89	.....	2.60

NOTE.—River frozen over Jan. 1 to 21, Dec. 19 to 31, and possibly for short periods at other times; slush ice was occasionally present.

Daily discharge, in second-feet, of Crooked River near Post, Oreg., for 1909.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	50	220	370	1,290	538	191	27	41	14	44	60
2	50	230	385	1,390	625	167	32	39	19	49	63
3	50	230	355	1,440	760	144	32	36	23	48	71
4	50	220	485	1,190	660	142	32	36	23	57	78
5	50	203	625	1,020	538	140	32	36	23	57	80
6	50	162	590	708	450	119	36	31	47	57	82
7	50	162	520	625	385	103	44	27	32	57	84
8	50	158	415	660	325	84	46	23	28	57	84
9	50	156	355	660	370	77	46	21	28	57	86
10	50	156	325	660	355	71	57	19	28	57	86
11	50	156	295	1,000	295	71	82	19	28	57	86
12	50	156	265	1,300	310	57	57	18	33	57	86
13	50	415	265	1,400	295	57	41	19	41	57	86
14	50	820	415	1,400	265	54	39	19	41	57	89
15	50	860	625	1,350	240	57	38	19	41	57	89
16	60	980	940	1,250	228	54	38	19	39	57	94
17	400	1,300	980	1,140	240	57	36	17	37	57	98
18	450	860	780	960	222	71	39	15	34	57	100
19	500	600	660	920	203	64	38	13	36	57	105
20	450	450	590	940	184	57	36	11	36	57	355

Daily discharge, in second-feet, of Crooked River near Post, Oreg., for 1909—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
21	400	274	520	820	172	54	32	10	40	57	215
22	380	277	485	780	172	52	30	10	42	57	2,560
23	350	295	485	780	172	46	27	10	46	57	2,740
24	325	355	820	680	167	41	27	10	40	57	2,190
25	305	325	1,080	780	162	36	27	10	37	57	1,060
26	285	325	1,310	830	172	34	36	10	34	57	642
27	265	310	1,390	800	196	32	46	9	36	57	415
28	250	400	1,420	700	340	30	46	10	37	57	415
29	250	.....	1,490	632	260	27	46	10	34	57	380
30	230	.....	1,340	520	215	27	44	10	38	57	340
31	210	.....	1,080	.....	215	.....	44	10	.....	57	.....

NOTE.—Daily discharge table for 1909 supersedes that published in Water-Supply Paper 272, page 395. The determinations are based on a rating curve that is fairly well defined between 200 and 1,500 second-feet but somewhat uncertain outside these limits.

Discharge Jan. 1 to 23, Jan. 28 to Feb. 4, and Nov. 29 and 30 estimated by comparison with the record at the Prineville station. Discharge Apr. 11 to 16 interpolated with the aid of a hydrograph following the rise and fall at the latter station.

Daily discharge, in second-feet, of Crooked River near Post, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	590	4,540	920	235	31	16	15	10	36	48
2	.....	520	3,530	940	252	26	15	15	10	36	52
3	.....	415	3,040	800	265	21	15	14	11	36	52
4	.....	325	2,440	700	415	21	15	14	12	36	52
5	.....	325	2,340	740	325	19	15	13	13	38	55
6	.....	310	1,740	820	240	17	14	13	14	41	57
7	.....	295	1,640	780	240	16	14	12	14	42	68
8	.....	295	1,640	820	240	13	14	12	15	46	89
9	.....	295	1,640	840	252	12	14	12	16	48	89
10	.....	295	1,540	860	252	13	13	12	17	49	88
11	.....	310	1,590	800	235	16	13	11	21	51	86
12	.....	325	1,640	800	215	15	13	11	23	53	94
13	.....	820	1,840	760	208	13	13	10	27	55	89
14	.....	1,220	1,940	590	191	12	13	10	32	57	84
15	.....	590	2,040	572	167	11	14	10	34	55	80
16	.....	520	2,090	555	144	9	14	9	41	54	78
17	.....	450	2,140	555	86	8	13	9	44	52	76
18	.....	358	2,090	555	82	8	14	8	46	49	72
19	.....	265	2,340	555	83	8	14	8	43	47	72
20	.....	265	2,290	538	57	8	23	8	40	47	100
21	.....	240	1,940	485	52	8	27	8	36	46	.....
22	900	240	2,090	468	57	13	41	8	36	46	.....
23	1,740	240	2,020	385	46	19	36	8	36	46	.....
24	2,040	1,160	1,590	355	46	19	27	8	35	47	.....
25	660	1,940	1,440	340	55	19	19	8	35	47	.....
26	478	1,640	1,140	340	44	19	18	8	34	46	.....
27	471	2,020	1,060	295	41	18	17	8	34	46	.....
28	485	3,040	980	265	52	18	16	8	35	45	.....
29	432	.....	860	235	47	17	16	9	36	45	.....
30	450	.....	800	235	42	16	15	10	36	45	.....
31	1,140	.....	840	.....	36	.....	15	10	.....	45	.....

NOTE.—Daily discharge for 1910 determined from a rating curve fairly well defined between 30 and 1,500 econd-feet.

Monthly discharge of Crooked River near Post, Oreg., for 1909–10.

[Drainage area, 1,390 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1909.							
January	[a] 500	[a] 50	189	0.136	0.16	11,600	D.
February	1,300	156	395	.284	.30	21,900	C.
March	1,490	265	699	.503	.58	43,000	B.
April	1,440	520	954	.686	.77	56,800	B.
May	760	162	314	.226	.26	19,300	B.
June	191	27	73.9	.053	.06	4,400	B.
July	82	27	39.8	.029	.03	2,450	C.
August	41	9	18.9	.014	.02	1,160	D.
September	47	14	33.8	.024	.03	2,010	C.
October	57	44	56.0	.040	.05	3,440	C.
November	2,740	60	431	.310	.35	25,600	B.
December	.....	.....	[a] 214	.154	.18	13,200	D.
The year	2,740	9	283	.204	2.79	205,000	
1910.							
January	2,040	.....	351	.253	.29	21,600	C.
February	3,040	240	690	.496	.52	38,300	C.
March	4,540	800	1,900	1.37	1.58	117,000	C.
April	940	235	597	.429	.48	35,500	B.
May	415	36	152	.109	.13	9,350	B.
June	31	8	15.4	.011	.01	916	B.
July	41	13	17.3	.012	.01	1,060	B.
August	15	8	10.3	.007	.01	633	B.
September	46	10	27.9	.020	.02	1,650	B.
October	57	36	46.2	.033	.04	2,840	B.
November	.....	48	102	.073	.08	6,070	B.
December	.....	.....	274	.197	.23	16,800	C.
The year	4,540	8	347	.250	3.40	252,000	

[a] Estimated.

NOTE.—Mean discharge Jan. 1 to 21 and Nov. 20 to Dec. 31 estimated, because of presence of ice from records at Prineville station; mean discharge Jan. 1 to 21 estimated at 100 second-feet; mean discharge Nov. 21 to 30 estimated at 157 second-feet.

CROOKED RIVER NEAR PRINEVILLE, OREG.

This station, which is located at Stearns's ranch, 5½ miles southeast of Prineville, in sec. 36, T. 15 S., R. 15 E., near the probable point of diversion for a proposed project to water a large amount of land north and west of Prineville, was established October 31, 1908.

Measurements are made from a plank walk built on the side of a flume which is carried across the river on a trestle.

The vertical staff gage is nailed to piling near the right bank about 6 feet upstream from the flume.

The channel at this station is somewhat shifting, conditions for measuring are good, and rating curves have been constructed to conform to each change in channel.

Discharge measurements of Crooked River near Prineville, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 12	L. R. Allen	87	377	3.30	858
June 1[a]	Stevens and Allen	27	15	.80	31.3
July 9[a]	L. R. Allen	21	8.8	.48	10.7
Sept. 10[a]	Allen and Davenport	21	7.0	.38	5.5
Nov. 5[a]	R. W. Davenport	28	17.6	.94	51.6
Dec. 3	.....do	87	258	2.30	413
3	.....do	87	242	2.08	339

[a] Made by wading.

Daily gage height, in feet, of Crooked River near Prineville, Oreg., for 1910.

[S. S. Stearns, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.2	9.4	3.3	2.0	0.8	0.46	0.40	0.35	0.83	0.90	2.20
2	.....	2.4	9.4	3.35	2.0	.7	.45	.40	.36	.83	.....	.....
3	1.4	2.0	7.9	3.2	2.0	.65	.45	.35	.37	.85	.90	2.35
4	.....	1.45	7.6	3.2	2.4	.65	.46	.35	.34	.85	.....	3.10
5	1.4	1.7	6.8	.....	2.2	.6	.45	.30	.35	.85	.93	3.20
6	.....	1.7	5.9	3.2	2.1	.6	.45	.30	.34	.87	.....	2.80
7	1.4	1.7	5.6	3.25	1.95	.55	.45	.30	.35	.87	.90	1.97
8	.....	1.6	5.5	3.2	1.9	.57	.45	.30	.36	.85	1.10	1.85
9	1.4	1.7	5.1	3.2	1.85	.48	.46	.35	.36	.85	1.10	1.76
10	.....	1.8	5.0	3.2	1.8	.5	.46	.35	.36	.85	1.10	1.97
11	1.4	1.55	5.15	3.3	2.0	.5	.45	.30	.32	.85	1.10	.....
12	.....	1.5	5.4	3.3	2.1	.55	.45	.30	.30	.93	1.40	2.20
13	1.4	1.6	5.45	3.1	1.9	.6	.42	.30	.32	.93	1.20	2.60
14	.....	4.0	5.6	3.0	1.7	.5	.40	.30	.35	1.00	1.20	.....
15	1.4	3.0	5.7	2.8	1.65	.5	.40	.30	.40	.....	1.20	2.10
16	.....	1.8	6.0	2.78	1.55	.7	.40	.30	.55	1.00	.....	.....
17	1.4	1.7	6.0	2.6	1.45	.6	.38	.30	.60	1.00	1.10	1.65
18	1.4	1.7	6.0	2.55	1.3	.6	.38	.30	.75	.93	.....	.....
19	1.4	1.6	6.2	2.55	1.2	.6	.38	.30	.85	.95	1.10	1.50
20	1.4	1.6	6.4	2.6	1.2	.6	.50	.35	.88	.95	.....	.....
21	1.4	1.5	5.9	2.6	1.1	.58	.44	.35	.87	.95	1.15	.....
22	2.4	1.4	5.9	2.5	1.1	.6	.40	.35	.87	.95	.....	1.30
23	9.0	1.4	6.0	2.4	1.1	.6	.45	.35	.87	.95	1.30	.....
24	7.5	1.5	5.3	2.3	1.0	.57	.50	.35	.85	.90	.....	1.50
25	4.4	7.1	4.7	2.3	.9	.58	.65	.35	.85	.....	1.40	.....
26	2.6	6.5	4.3	2.2	.85	.57	.55	.35	.80	.92	1.30	1.60
27	2.2	5.2	4.1	2.2	.9	.55	.55	.35	.80	.....	1.30	1.30
28	2.2	6.7	3.9	2.1	.9	.5	.55	.35	.75	.90	1.50	.....
29	2.3	.....	3.6	2.0	.9	.5	.50	.35	.75	.....	2.10	1.43
30	2.3	.....	3.25	1.95	.85	.48	.50	.35	.75	.90	2.20	.....
31	2.8	.....	3.2	.....	.85	.....	.40	.35	.....	.....	.....	1.60

NOTE.—River frozen over Jan. 3 to 21; gage heights raised by ice jams Jan. 22 to 24. Slush ice also reported occasionally.

Daily discharge, in second-feet, of Crooked River near Prineville, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	108	1,000	4,750	864	310	31	8.8	7.0	6.0	35	44	376
2	108	600	4,750	890	310	22	8.5	7.0	6.2	35	44	404
3	108	430	3,760	813	310	18	8.5	6	6.4	38	44	431
4	108	230	3,570	813	450	18	8.8	6	5.8	38	46	763
5	108	315	3,040	813	376	15	8.5	5	6.0	38	49	813
6	108	315	2,440	813	342	15	8.5	5	5.8	40	46	621
7	108	315	2,250	838	295	12	8.5	5	6.0	40	44	301
8	108	280	2,180	813	280	14	8.5	5	6.2	38	78	265
9	108	315	1,920	813	265	9.4	8.8	6	6.2	38	78	238
10	108	350	1,860	813	250	10	8.8	6	6.2	38	78	301
11	108	262	1,950	864	310	10	8.5	5	5.4	38	78	338
12	108	245	2,110	864	342	12	8.5	5	5.0	49	143	376
13	108	280	2,150	763	280	15	7.6	5	5.4	49	98	532
14	108	1,450	2,250	715	221	10	7.0	5	6.0	60	98	437
15	108	900	2,310	621	207	10	7.0	5	7.0	60	98	342
16	108	350	2,510	612	180	22	7.0	5	12	60	88	274
17	108	315	2,510	532	155	15	6.6	5	15	60	78	207
18	108	315	2,510	511	120	15	6.6	5	26	49	78	187
19	108	280	2,640	511	98	15	6.6	5	38	52	78	167
20	108	280	2,770	532	98	15	10	6	41	52	83	149
21	108	245	2,440	532	78	14	8.2	6	40	52	88	138
22	300	215	2,440	490	78	15	7.0	6	40	52	104	120
23	2,510	215	2,510	450	78	15	8.5	6	40	52	120	144
24	1,910	245	2,050	412	60	14	10	6	38	44	132	167
25	845	3,580	1,680	412	44	14	18	6	38	46	143	180
26	700	3,110	1,440	376	38	14	12	6	31	47	120	193
27	510	2,200	1,320	376	44	12	12	6	31	46	120	120
28	510	3,260	1,200	342	44	10	12	6	26	44	167	135
29	550	.....	1,030	310	44	10	10	6	26	44	342	150
30	550	.....	838	295	38	9.4	10	6	26	44	376	172
31	800	.....	813	.....	38	.....	7.0	6	.....	44	.....	193

NOTE.—Daily discharge Jan. 1 to Feb. 28 determined from the 1909 rating curve, which is well defined below 1,300 second-feet; discharge Mar. 1 to Dec. 31 determined from a curve well defined between 5 and 1,000 second-feet; shift occurred in the flood the first of March. Discharge Jan. 1 to 25 reduced 50 per cent on account of ice.

Monthly discharge of Crooked River near Prineville, Oreg., for 1910.

[Drainage area, 1,990 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	2,510	108	369	0.185	0.21	22,700	D.
February	3,580	215	782	.393	.41	43,400	B.
March	4,750	813	2,320	1.17	1.35	143,000	B.
April	890	295	627	.315	.35	37,300	A.
May	450	38	187	.094	.11	11,500	A.
June	31	9.4	14.4	.0072	.008	857	A.
July	18	6.6	8.91	.0045	.005	548	A.
August	7.0	5.0	5.65	.0028	.003	347	A.
September	41	5.0	18.6	.0093	.01	1,110	A.
October	60	35	45.9	.023	.03	2,820	A.
November	376	44	106	.053	.06	6,310	A.
December	813	120	298	.150	.17	18,300	A.
The year	4,750	5.0	398	.200	2.72	288,000	

OCHOCO CREEK NEAR HOWARD, OREG.

This station, which is located at the ranger station about 7 miles above Howard, Oreg., and about 25 miles above Prineville, was

established October 28, 1910, in cooperation with the United States Forest Service.

Discharge measurements are made by wading in the vicinity of the gage.

The gage height record is somewhat fragmentary, and no estimate of flow is yet possible.

Discharge measurements of Ochoco Creek near Howard, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 28	R. W. Davenport	4.5	0.8	0.48	0.5
Dec. 1	do	7.5	2.5	0.70	4

Daily gage height, in feet, of Ochoco Creek near Howard, Oreg., for 1910.

[C. C. Hon, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1			0.70	11		0.65	0.82	21			0.75
2			.75	12		.58	.82	22			.73
3			.90	13		.54	.80	23			.70
4			.95	14			.78	24			.70
5			.88	15			.75	25			.70
6		0.48	.85	16			.75	26			.70
7		.50	.83	17			.75	27			.70
8		.65	.82	18			.75	28	0.48		.69
9		.60	.82	19			.75	29	.48		.68
10		.58	.82	20			.75	30			.68
								31			.68

OCHOCO CREEK AND ELLIOTT DITCH NEAR PRINEVILLE, OREG.

The station on Ochoco Creek was established October 29, 1908, at Elliott's ranch, 6 miles east of Prineville, Oreg., in the NE. ¼ sec. 5, T. 15 S., R. 17 E., on the dam site for a reservoir proposed in connection with the development of the Ochoco irrigation project by the United States Reclamation Service.

The vertical staff gage is fastened to an alder on the left bank just above the cable from which discharge measurements are made. The gage datum was lowered 0.75 foot July 15, 1909, and all 1909 readings corrected to the new datum. The gage heights in 1908, published in Water-Supply Paper 252, page 329, should be increased 0.75 foot to be comparable with the 1909 gage heights.

The Elliott ditch diverts water from the left bank of the creek about 1,000 feet above the gaging station. Records are kept on the flow in the ditch in order to determine the natural flow of the creek. The vertical staff gage is installed in the ditch about 150 feet upstream from the creek gage. Discharge measurements are made from a foot plank.

Discharge measurements of Ochoco Creek near Prineville, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 11	L. R. Allen	50	56	1.90	178
Apr. 11	do	50	58	1.90	187
May 10	Stevens and Allen	48	50	1.68	130

Daily gage height, in feet, and discharge, in second-feet, of Ochoco Creek near Prineville, Oreg., for 1910.

[David Elliott, observer.]

Day.	January.		February.		March.		April.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.5	100	1.8	158	2.85	475	2.1	234
2	1.4	83	1.5	100	3.0	530	2.1	234
3	2.0	208	1.5	100	3.15	588	2.0	208
4	2.1	234	1.5	100	3.2	608	1.9	182
5	2.1	234	1.6	118	3.15	588	2.0	208
6	1.7	137	1.6	118	2.7	422	1.9	182
7	1.7	137	1.5	100	2.5	354	1.9	182
8	1.6	118	1.5	100	2.6	387	1.9	182
9	1.5	100	1.5	100	2.7	422	1.8	158
10	1.5	100	1.5	100	2.65	404	1.8	158
11	1.6	118	1.5	100	2.75	440	1.9	182
12	1.5	100	1.5	100	2.85	475	1.9	182
13	1.5	100	1.6	118	2.9	493	1.9	182
14	1.6	118	1.5	100	2.95	512	1.8	158
15	1.4	83	1.4	83	2.85	475	1.8	158
16	1.5	100	1.3	67	2.7	422	1.8	158
17	1.5	100	1.4	83	2.7	422	1.8	158
18	1.3	67	1.4	83	2.65	404	1.8	158
19	1.2	52	1.5	100	2.8	457	1.6	118
20	1.1	38	1.4	83	2.8	457	1.6	118
21	1.4	83	1.2	52	2.75	440	1.6	118
22	1.9	182	1.3	67	2.95	512	1.6	118
23	2.7	422	1.4	83	2.75	440	1.8	158
24	2.4	321	2.6	387	2.75	440	1.4	83
25	2.0	208	1.7	137	2.7	422	1.4	83
26	1.8	158	1.5	100	2.5	354	1.4	83
27	1.8	158	1.5	100	2.4	321	1.4	83
28	1.7	137	2.1	234	2.3	291	1.3	67
29	1.5	100	.....	.....	2.3	291	1.3	67
30	1.6	118	.....	.....	2.2	262	1.3	67
31	2.0	208	.....	.....	2.2	262	.....	.....

NOTE.—Probably little or no ice at this station.

Daily discharge determined from a rating curve practically the same as that used for 1909 and well defined below 500 second-feet. Elliott ditch carried a small amount of water past the station Apr. 10 to 30.

Monthly discharge of Ochoco Creek near Prineville, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	422	38	143	8,790	B.
February	387	52	110	6,110	B.
March	608	262	431	26,500	B.
April	234	67	148	8,810	B.

METOLIUS RIVER BASIN.

GENERAL FEATURES.

Metolius River rises on the eastern slopes of the Cascade Mountains, in the western part of Cook County, Oreg., flows northward 18 miles, then turns abruptly southeast and east to its junction with Deschutes River, 6 miles northwest of Haystack.

Throughout its course the stream runs in a deep canyon. Its flow is derived largely from springs and is well maintained throughout the year.

METOLIUS RIVER AT ALLINGHAM RANGER STATION, NEAR SISTERS, OREG.

This station, which is located in sec. 3, T. 12 S., R. 9 E., at Allingham ranger station, about 17 miles northwest of Sisters, Oreg., was established September 16, 1910, in cooperation with the United States Forest Service.

The station is above all diversions, the flow being derived largely from springs, is even and the river does not freeze, so that reliable discharge estimates may be made.

Gage height observations are a little irregular.

Discharge measurements of Metolius River at Allingham ranger station, near Sisters, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 15	Allen and Davenport	86	166	0.59	377
Nov. 11	R. W. Davenport	83	163	.61	376

Daily gage height, in feet, of Metolius River at Allingham ranger station, near Sisters, Oreg., for 1910.

[P. A. South, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		0.58	0.59	0.72	16			0.60	0.70
2		.58	.59	.74	17	0.58		.60	.69
3		.60	.59	.77	18		0.59	.60	.69
4		.60	.59	.80	19		.59	.60	.69
5		.60	.58	.76	20		.58	.62	.68
6		.59	.58	.74	21		.59	.64	.68
7		.59	.60	.73	22		.59	.69	.67
8			.63	.79	23		.59	.67	
9			.64	.77	24		.59	.67	.67
10			.63		25		.59	.66	.67
11			.62	.73	26		.59	.66	.66
12			.61	.73	27		.59	.69	.65
13			.61	.72	28	.57	.59	.75	.65
14			.60	.71	29	.57	.59	.73	.65
15	0.59		.60	.71	30	.58	.59	.71	.65
					31		.59		.64

NOTE.—No ice at this station.

METOLIUS RIVER AT HUBBARD'S RANCH, NEAR SISTERS, OREG.

This station, which is located in sec. 34, T. 10 S., R. 10 E., at the ranch of Carl T. Hubbard, about 28 miles north of Sisters, Oreg., was established April 24, 1910.

No equipment has been provided for discharge measurements.

Gage heights have been furnished by Carl T. Hubbard without cost to the Survey.

Daily gage height, in feet, of Metolius River at Hubbard's ranch, near Sisters, Oreg., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.47	0.48	0.30	0.29	0.20	0.20	0.15	0.40
2	.....	.49	.44	.31	.28	.20	.20	.15	.42
3	.....	.49	.42	.31	.27	.20	.52	.15	.51
4	.....	.48	.40	.32	.27	.20	.40	.15	.48
5	.....	.44	.42	.33	.27	.19	.35	.15	.41
6	.....	.44	.40	.34	.27	.18	.20	.15	.38
7	.....	.46	.40	.34	.27	.18	.20	.15	.38
8	.....	.48	.38	.33	.27	.18	.19	.....	.42
9	.....	.52	.37	.35	.27	.18	.18	.....	.40
10	.....	.66	.37	.35	.27	.18	.18	.....	.37
11	.....	.60	.48	.35	.28	.18	.20	.....	.35
12	.....	.54	.41	.36	.28	.18	.18	.21	.34
13	.....	.52	.38	.34	.27	.20	.17	.20	.33
14	.....	.50	.38	.32	.26	.18	.15	.19	.30
15	.....	.48	.36	.32	.25	.18	.15	.18	.30
16	.....	.48	.42	.32	.22	.18	.18	.18	.30
17	.....	.47	.39	.32	.21	.18	.25	.18	.30
18	.....	.46	.36	.32	.21	.18	.20	.21	.29
19	.....	.46	.40	.32	.22	.18	.18	.20	.28
20	.....	.43	.35	.31	.22	.26	.18	.20	.27
21	.....	.42	.35	.30	.21	.22	.18	.....	.27
22	.....	.41	.36	.30	.20	.20	.18	.35	.26
23	.....	.43	.34	.30	.20	.18	.18	.....	.26
24	0.56	.47	.32	.30	.20	.18	.18	.35	.28
25	.57	.50	.32	30	.20	.18	.17	.....	.27
26	.58	.....	.32	.30	.20	.18	.17	.....	.27
27	.56	.43	.32	.30	.20	.18	.16	.30	.26
28	.52	.40	.30	.30	.20	.18	.16	.36	.26
29	.50	.42	.30	.30	.20	.18	.16	.42	.26
30	.50	.44	.30	.29	.20	.18	.16	.38	.25
31	.....	.46	.....	.29	.20	.....	.16	.....	.25

METOLIUS RIVER AT RIGGS'S RANCH, NEAR SISTERS, OREG.

This station, which is located at Riggs's ranch, 7 miles above the mouth of the stream and 26 miles northeast of Sisters, in sec. 28, T. 11 S., R. 11 E., was established October 22, 1908.

A vertical staff gage is located about 50 feet upstream from the cable, from which discharge measurements are made.

Discharge computations are withheld pending further study.

Discharge measurements of Metolius River at Riggs's ranch, near Sisters, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 15	L. R. Allen	100	350	0.89	1,760
15	.....do	100	348	.89	1,800
June 28	.....do	100	345	.75	1,630
Sept. 13	Allen and Davenport	99	339	.60	1,480
13	R. W. Davenport	99	339	.62	1,550
Nov. 10	.....do	100	381	1.12	1,940

Daily gage height, in feet, Metolius River at Riggs's ranch, near Sisters, Oreg., for 1910.

[D. N. Riggs, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.75	0.8	1.7	0.95	0.9	0.85	0.75	0.7	0.6	0.55	0.55	0.75
2	.75	.8	1.9	.95	.9	.85	.75	.7	.6	.55	.55	.8
3	.7	.75	1.85	.95	.9	.85	.75	.7	.6	1.0	.55	1.0
4	.7	.75	1.7	.95	.85	.8	.75	.7	.6	.7	.55	.9
5	.7	.75	1.6	.95	.85	.8	.75	.7	.6	.7	.55	.85
6	.7	.75	1.5	.9	.85	.8	.75	.7	.6	.65	.55	.85
7	.7	.75	1.4	.9	.85	.8	.75	.7	.6	.6	.62	.85
8	.7	.75	1.3	.9	.85	.8	.75	.7	.6	.6	.6	.85
9	.7	.75	1.3	.9	.85	.8	.75	.7	.6	.6	.8	.85
10	.7	.75	1.3	.9	1.1	.8	.75	.7	.6	.6	1.0	.85
11	.7	.7	1.25	.9	1.0	.9	.75	.7	.6	.6	.8	.8
12	.65	.7	1.2	.9	.95	.85	.75	.7	.6	.7	.6	.8
13	.65	.7	1.2	.9	.95	.8	.75	.7	.6	.6	.6	.75
14	.65	.7	1.2	.9	.95	.8	.75	.7	.6	.6	.6	.75
15	.65	.7	1.2	.85	.9	.8	.75	.65	.6	.6	.6	.75
16	.65	.7	1.2	.85	.9	.85	.75	.65	.6	.6	.6	.75
17	.65	.7	1.2	.85	.9	.85	.75	.65	.6	.6	.6	.75
18	.75	.7	1.2	.85	.9	.8	.75	.65	.55	.6	.6	.7
19	.7	.7	1.2	.9	.9	.8	.75	.65	.6	.6	.6	.65
20	.65	.7	1.2	.9	.85	.8	.75	.65	.65	.6	.6	.65
21	.7	.7	1.15	.9	.85	.8	.75	.65	.65	.6	.95	.65
22	.9	.7	1.15	.9	.85	.75	.75	.65	.65	.55	1.1	.65
23	1.05	.7	1.1	.9	.85	.75	.75	.65	.6	.55	1.1	.65
24	1.0	.7	1.1	.95	.95	.75	.7	.65	.6	.55	.8	.65
25	.9	.85	1.05	1.0	.95	.75	.7	.65	.6	.55	.75	.65
26	.9	.8	1.05	1.0	.95	.75	.7	.65	.6	.55	.75	.65
27	.85	1.08	1.0	.95	.9	.75	.7	.6	.6	.55	.75	.65
28	.8	.....	1.0	.95	.85	.75	.7	.6	.55	.55	.75	.65
29	.8	.....	1.0	.95	.85	.75	.7	.6	.55	.55	.9	.65
30	.8	.....	1.0	.9	.85	.75	.7	.6	.55	.55	.8	.65
31	.8	.....	.95	.....	.85	.....	.7	.6	.....	.55	.....	.65

NOTE.—No ice.

CANALS AND DITCHES IN DESCHUTES RIVER BASIN.

CENTRAL OREGON AND PILOT BUTTE CANALS NEAR BEND, OREG.

The Central Oregon and Pilot Butte canals have a common headgate, where water is diverted from Deschutes River, 3 miles above the town of Bend. They are operated for the reclamation of a large area of land segregated under the provisions of the Carey Act by the Central Oregon Irrigation Co., successor to the Deschutes Irrigation & Power Co., by which the gage-height records are furnished without cost to the Survey.

The station on the Central Oregon canal was established March 11, 1905. Measurements are made in a flume.

The station on the Pilot Butte canal was established March 6, 1905, half a mile below the wasteway and 1 mile below the point where the water diverted from Deschutes River is divided into the two canals. The measurements are made in an earth section, and small changes in the channel have operated to make the results less accurate than they would have been had the channel been stable.

The water is turned out of these canals in freezing weather.

Discharge measurements of Central Oregon canal near Bend, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 22	L. R. Allen	13.2	27	2.08	159
June 21	do	13.2	35	2.67	251
July 6	do	13.2	34	2.55	234
Sept. 18	Allen and Davenport	13.2	29	2.20	172

Daily gage height, in feet, of Central Oregon canal near Bend, Oreg., for 1910.

[N. P. Vinyard, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	1.4	2.2	0.3	2.8	3.0	0.85	2.2	2.1	0.9
2	.....	.....	0.35	1.5	2.2	1.3	2.75	.2	1.6	2.25	2.1	1.15
3	.....	.....	.35	1.55	2.2	1.7	2.75	.....	2.5	2.2	2.1	1.65
4	.....	.....	.3	1.55	2.2	.8	2.6	.....	2.7	2.3	2.05	1.65
5	.....	.....	.....	1.5	2.15	1.9	2.55	.....	2.7	2.3	.....	1.8
6	.....	0.45	.3	1.5	2.15	2.45	2.55	.....	2.7	2.3	.15	1.8
7	1.1	.9	.....	1.5	2.15	2.7	2.65	.....	2.7	2.3	.3	1.5
8	1.45	.55	.8	1.7	2.2	2.8	2.75	.....	2.7	2.3	.35	1.5
9	.8	.....	1.1	1.7	2.2	2.8	2.9	.....	2.7	2.3	.35	1.5
10	.....	.....	1.45	1.7	2.2	2.8	2.9	.....	2.7	2.3	.35	1.5
11	.45	.....	1.45	1.7	2.2	2.8	2.9	.....	2.6	2.3	.2	1.5
12	.9	.....	1.55	1.7	2.2	2.85	2.9	.75	2.6	2.3	.2	1.5
13	.6	.....	.8	1.7	2.2	2.85	2.9	1.9	2.6	2.3	.2	.75
14	.6	.5	.45	1.7	2.2	2.85	2.9	2.4	2.55	2.3	.....	.75
15	.8	1.0	.9	1.7	2.2	2.85	2.9	2.6	2.45	2.3	.....	1.5
16	.8	1.1	.85	1.7	2.2	2.85	3.0	2.7	2.4	2.2	.35	1.5
17	.8	1.25	.8	1.7	2.3	2.85	3.0	2.75	2.4	2.2	1.1	1.5
18	.8	1.4	.8	1.7	2.35	2.85	3.0	2.8	2.4	2.2	1.1	1.5
19	.....	1.45	1.2	1.7	2.4	2.85	3.0	2.8	2.0	2.2	1.1	1.5
20	.....	1.4	1.6	1.9	2.5	2.8	3.0	2.9	1.9	2.1	1.1	1.5
21	.....	1.3	1.45	1.95	2.6	2.7	3.0	2.9	2.3	2.1	1.1	1.0
22	.....	.65	1.2	2.1	2.65	2.35	3.0	2.9	2.35	2.1	1.1	1.0
23	.9	.....	.9	2.1	2.75	2.3	3.0	2.9	2.4	2.1	1.1	.8
24	.45	.4	1.0	2.1	2.7	2.55	3.0	2.9	2.35	2.1	1.1	.8
25	.....	.4	1.05	2.1	2.75	2.6	3.0	2.9	2.4	2.1	1.1	.6
26	.....	.5	1.1	2.1	2.8	2.6	3.0	2.9	2.3	2.1	1.1	.4
27	.....	.95	1.15	2.15	1.45	2.6	3.0	2.9	2.3	2.1	1.0	.4
28	.....	.....	1.15	2.2	.....	2.7	3.0	1.45	2.3	2.1	.9	.9
29	.....	.....	1.15	2.2	.....	2.75	3.0	.8	2.2	2.1	.9	.9
30	.9	.....	1.15	2.2	.....	2.8	3.0	.8	2.2	2.1	.9	1.1
31	.45	.....	1.3	.....	.....	.....	3.0	.8	.....	2.1	.....	1.3

NOTE.—Canal sometimes freezes in the winter; gage heights probably not materially affected by ice; the winter records are not of especial importance.

Daily discharge, in second-feet, of Central Oregon canal near Bend, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	0	81	178	7	274	310	36	178	164	40
2	0	0	9	91	178	72	266	3	102	185	164	59
3	0	0	9	96	178	113	266	0	224	178	164	108
4	0	0	7	96	178	33	240	0	257	192	157	108
5	0	0	0	91	171	137	232	0	257	192	0	125
6	0	14	7	91	171	216	232	0	257	192	2	125
7	55	40	0	91	171	257	248	0	257	192	7	91
8	86	18	33	113	178	274	266	0	257	192	9	91
9	33	0	55	113	178	274	291	0	257	192	9	91
10	0	0	86	113	178	274	291	0	257	192	9	91
11	14	0	86	113	178	274	291	0	240	192	3	91
12	40	0	96	113	178	282	291	30	240	192	3	91
13	21	0	33	113	178	282	291	137	240	192	3	30
14	21	16	14	113	178	282	291	208	232	192	0	30
15	33	47	40	113	178	282	291	240	216	192	0	91
16	33	55	36	113	178	282	310	257	208	178	9	91
17	33	68	33	113	192	282	310	266	208	178	55	91
18	33	81	33	113	200	282	310	274	208	178	55	91
19	0	86	63	113	208	282	310	274	150	178	55	91
20	0	81	102	137	224	274	310	291	137	164	55	91
21	0	72	86	144	240	257	310	291	192	164	55	47
22	0	24	63	164	248	200	310	291	200	164	55	47
23	40	0	40	164	266	192	310	291	208	164	55	33
24	14	11	47	164	257	232	310	291	200	164	55	33
25	0	11	51	164	266	240	310	291	208	164	55	21
26	0	16	55	164	274	240	310	291	192	164	55	11
27	0	44	59	171	86	240	310	291	192	164	47	11
28	0	0	59	178	0	257	310	86	192	164	40	40
29	0	.....	59	178	0	266	310	33	178	164	40	40
30	40	.....	59	178	0	274	310	33	178	164	40	55
31	14	.....	72	.....	0	.....	310	33	.....	164	.....	72

NOTE.—Daily discharge determined from a rating curve well defined between 100 and 260 second-feet and fairly well outside these limits. Below 150 second-feet the curve gives figures slightly smaller than those derived from the 1909 curve.

Monthly discharge of Central Oregon canal near Bend, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	86	0	16.5	1,010	B.
February	86	0	24.4	1,360	B.
March	102	0	44.9	2,760	B.
April	178	81	127	7,560	A.
May	274	0	171	10,500	A.
June	282	7	229	13,600	A.
July	310	232	291	17,900	A.
August	310	0	146	8,980	A.
September	257	36	206	12,300	A.
October	192	164	178	10,900	A.
November	164	0	47.3	2,810	A.
December	125	11	68.6	4,220	A.
The year	310	0	130	93,900	

Discharge measurements of Pilot Butte canal near Bend, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 21	L. R. Allen	43	93	2.84	190
July 6	do	43	93	2.85	191
Sept. 18	Allen and Davenport	39	78	2.53	129

Daily gage height, in feet, of Pilot Butte canal near Bend, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.90	0.82	.....	2.15	2.60	2.55	2.85	2.90	2.75	2.50	2.40	2.25
2	.....	.....	.....	2.15	2.60	2.68	2.85	2.62	2.75	2.52	2.40	2.10
3	.....	.....	.....	2.15	2.55	2.70	2.85	2.65	2.75	2.52	2.40	1.90
4	.....	.90	.....	2.15	2.35	2.68	2.85	2.72	2.75	2.52	2.40	1.85
5	.....	1.75	1.00	2.15	2.35	2.78	2.85	2.80	2.75	2.50	2.40	1.75
6	.....	1.70	2.00	2.15	2.35	2.80	2.85	2.80	2.75	2.45	2.40	1.70
7	.....	1.95	1.00	2.15	2.60	2.80	2.85	2.80	2.75	2.45	1.20	1.70
8	.....	.....	.....	2.15	2.60	2.80	2.85	2.80	2.75	2.45	.....	1.70
9	.....	.....	.98	2.15	2.60	2.80	2.85	2.80	2.75	2.45	.....	1.62
10	.....	.....	1.95	2.15	2.55	2.80	2.85	2.80	2.75	2.45	.....	1.55
11	.....	.....	2.00	2.15	2.50	2.82	2.85	2.80	2.60	2.45	.....	1.55
12	.....	.....	2.00	2.15	2.50	2.85	2.85	2.75	2.60	2.45	1.18	1.55
13	.....	.....	2.00	2.15	2.50	2.85	2.85	2.80	2.60	2.45	1.18	1.72
14	.....	.....	2.00	2.15	2.50	2.85	2.85	2.90	2.60	2.45	.....	2.10
15	.....	1.90	1.70	2.15	2.50	2.85	2.85	2.90	2.60	2.45	.....	2.10
16	.....	2.00	1.55	2.15	2.50	2.85	2.88	2.90	2.55	2.45	.75	2.10
17	1.90	1.98	1.55	2.15	2.50	2.85	2.90	2.90	2.55	2.45	1.35	.....
18	1.00	.98	1.55	2.20	2.50	2.85	2.90	2.90	2.55	2.45	1.20	.....
19	.....	.....	1.55	2.25	2.55	2.85	2.90	2.90	2.40	2.45	1.65	.....
20	.....	.....	1.55	2.25	2.60	2.85	2.90	2.90	2.28	2.40	2.10	.....
21	.....	.....	1.65	2.28	2.60	2.85	2.90	2.90	2.55	2.40	1.05	.....
22	.70	.....	1.65	2.30	2.60	2.85	2.90	2.90	2.55	2.40	.....	.....
23	1.40	.....	1.65	2.35	2.65	2.85	2.90	2.90	2.55	2.40	.....	1.80
24	.....	.80	1.70	2.45	2.70	2.85	2.90	2.90	2.52	2.40	.....	2.05
25	.....	.80	2.10	2.52	2.70	2.85	2.90	2.90	2.50	2.40	.....	1.05
26	.....	1.75	2.10	2.58	2.75	2.85	2.90	2.90	2.50	2.40	.....	.....
27	.....	1.48	2.10	2.60	1.40	2.85	2.90	2.90	2.50	2.40	1.10	.....
28	.....	.....	2.10	2.60	.....	2.85	2.90	2.85	2.50	2.40	2.20	.....
29	.....	.....	2.10	2.60	1.05	2.85	2.90	2.80	2.48	2.40	2.20	.....
30	.....	.....	1.65	2.60	2.22	2.85	2.90	2.80	2.50	2.40	2.22	.....
31	1.65	.....	1.62	.....	2.35	.....	2.90	2.78	.....	2.40	.....	.....

Daily discharge, in second-feet, of Pilot Butte canal near Bend, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	42	2	0	73	144	136	192	202	172	127	111	88
2	0	0	0	73	144	158	192	148	172	130	111	66
3	0	0	0	73	136	162	192	153	172	130	111	42
4	0	3	0	73	103	158	192	166	172	130	111	38
5	0	30	4	73	103	178	192	182	172	130	111	30
6	0	27	53	73	103	182	192	182	172	119	111	27
7	0	48	4	73	144	182	192	182	172	119	7	27
8	0	0	0	73	144	182	192	182	172	119	0	27
9	0	0	4	73	144	182	192	182	172	119	0	22
10	0	0	48	73	136	182	192	182	172	119	0	18
11	0	0	53	73	127	186	192	182	144	119	0	18
12	0	0	53	73	127	192	192	172	144	119	7	18
13	0	0	53	73	127	192	192	182	144	119	7	28
14	0	0	53	73	127	192	192	202	144	119	0	66
15	0	42	27	73	127	192	192	202	144	119	0	66
16	0	53	18	73	127	192	198	202	136	119	2	66
17	42	51	18	73	127	192	202	202	136	119	10	0
18	4	4	18	80	127	192	202	202	136	119	7	0
19	0	0	18	88	136	192	202	202	111	119	24	0
20	0	0	18	88	144	192	202	202	92	111	66	0
21	0	0	24	92	144	192	202	202	136	111	4	0
22	2	0	24	95	144	192	202	202	136	111	0	0
23	12	0	24	103	153	192	202	202	136	111	0	34
24	0	2	27	119	162	192	202	202	130	111	0	60
25	0	2	66	130	162	192	202	202	127	111	0	4
26	0	30	66	141	172	192	202	202	127	111	0	0
27	0	15	66	144	12	192	202	202	127	111	5	0
28	0	0	66	144	0	192	202	192	127	111	80	0
29	0	.....	66	144	4	192	202	182	124	111	80	0
30	0	.....	24	144	83	192	202	182	127	111	83	0
31	23	.....	22	.....	103	.....	202	178	.....	111	.....	0

NOTE.—These discharges are based on a rating table that is well defined between 35 and 200 second-feet.

Monthly discharge of Pilot Butte canal near Bend, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	42	0	4.0	246	B.
February	53	0	11.0	611	B.
March	66	0	29.6	1,820	B.
April	144	73	91.8	5,460	A.
May	172	0	121	7,440	A.
June	192	136	185	11,000	A.
July	202	192	197	12,100	A.
August	202	148	189	11,600	A.
September	172	92	145	8,630	A.
October	130	111	118	7,260	A.
November	111	0	34.9	2,080	A.
December	88	0	24.0	1,480	B.
The year	202	0	96.2	69,700	

WIMER CANAL NEAR LAIDLAW, OREG.

The Wimer canal diverts water from Tumalo Creek about three-fourths of a mile above the headgate of the Columbia Southern canal.

The station was established June 16, 1906, just below the head gate of the canal and above the wasteway. It is maintained during the irrigation season only. The quantities shown during 1906–7 represent the amount diverted from the river. A part of this was returned through the wasteway which enters Tumalo Creek above the head gate of the Columbia Southern canal. On April 1, 1908, the station was moved to a point below the wasteway, and the records for that year show the net amount diverted for irrigation. The water is turned out of the canal during freezing weather.

Discharge measurements of Wimer canal near Laidlaw, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	L. R. Allen	4	1.4	0.35	1.5
June 22	do	4	5.5	1.38	21.0
Sept. 17	Allen and Davenport	4	3.8	.95	11.4
Nov. 15	R. W. Davenport	4	2.4	.60	5.3

Daily gage height, in feet, and discharge, in second-feet, of Wimer canal near Laidlaw, Oreg., for 1910.

[C. A. Reeves, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.45	26	1.45	26	1.7	33				
2				26	1.4	24	1.5	27				
3			1.5	27	1.3	21	1.5	27				
4			1.4	24	1.4	24	1.5	27				
5			1.4	24	1.4	24	1.5	27				
6			1.4	24	1.4	24	1.55	28				
7			1.45	26	1.4	24	1.6	30				
8			1.6	30	1.35	22	1.5	27				
9			1.55	28	1.35	22	1.6	30				
10			1.5	27	1.4	24						
11	0.95	12	1.4	24	1.45	26						
12	.95	12	1.4	24	1.4	24						
13	.95	12	1.4	24	1.35	22						
14	1.3	21	1.4	24	1.35	22						
15	1.3	21	1.4	24	1.3	21						
16	1.3	21	1.4	24	1.4	24						
17	1.3	21	1.4	24	1.4	24						
18	1.3	21	1.4	24	1.4	24						
19	1.4	24	1.4	24	1.5	27						
20	1.4	24	1.4	24	1.45	26					1.0	13
21	1.4	24	1.4	24	1.4	24						
22	1.4	24	1.4	24	1.4	24						
23	1.5	27	1.4	24	1.35	22					1.0	13
24	1.5	27	1.45	26	1.6	30						
25	1.5	27	1.45	26	1.6	30						
26	1.5	27	1.4	24	1.55	28						
27	1.5	27	1.4	24	1.55	28						
28	1.5	27	1.4	24	1.55	28						
29	1.5	27	1.4	24	1.55	28						
30	1.45	26	1.4	24	1.55	28						
31			1.45	26								

NOTE.—Daily discharges determined from a well-defined rating curve.

Monthly discharge of Wimer canal near Laidlaw, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 11–30	27	12	22.6	897	A.
May	30	24	24.9	1,530	A.
June	30	21	24.8	1,480	A.
July 1–9	33	27	28.4	507	A.

COLUMBIA SOUTHERN CANAL NEAR LAIDLAW, OREG.

The Columbia Southern canal was constructed by the Columbia Southern Irrigation Co. for the irrigation of about 27,000 acres of land to be reclaimed under the provisions of the Carey Act.

The gaging station, which is located in a flume 200 yards below the headgate of the canal, was established May 15, 1906. The records of gage heights are furnished without cost to the Survey by the company.

The records of flow at this station are of great value to the State, the company, and to the settlers on the project. The conditions are favorable for good results, and the data so far obtained are reliable. The station is maintained during the irrigating season only.

The water is turned out of the canal during freezing weather.

Discharge measurements of Columbia Southern canal near Laidlaw, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 20	L. R. Allen	19.5	32	1.65	53.5
June 22	do	19.6	39.4	2.01	95
Sept. 17	Allen and Davenport	19.5	33.2	1.70	59
Nov. 15	R. W. Davenport	.....	.....	.63	[a] 2.5

[a] Discharge estimated.

Daily gage height, in feet, and discharge, in second-feet, of Columbia Southern canal near Laidlaw, Oreg., for 1910.

[C. A. Reeves, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.45	38	1.8	69	2.15	111	2.0	91	1.65	54	1.7	59
2	1.45	38	1.75	64	2.15	111	2.0	91	1.65	54	1.7	59
3	1.45	38	1.75	64	2.15	111	1.95	85	1.65	54	1.7	59
4	1.45	38	1.75	64	2.1	104	2.0	91	1.65	54	1.7	59
5	1.5	42	1.75	64	2.2	118	2.0	91	1.65	54	1.7	59
6	1.5	42	1.75	64	2.15	111	2.0	91	1.65	54	1.75	64
7	1.5	42	1.75	64	2.15	111	1.95	85	1.65	54	1.7	59
8	1.5	42	1.8	69	2.15	111	2.0	91	1.65	54	1.7	59
9	1.5	42	1.75	64	2.15	111	2.0	91	1.65	54	1.7	59
10	1.5	42	1.8	69	2.15	111	2.0	91	1.65	54	1.7	59
11	1.5	42	1.75	64	2.2	118	2.0	91	1.65	54	1.7	59
12	1.5	42	1.75	64	2.15	111	2.0	91	1.65	54	.....	.....
13	1.5	42	1.75	64	2.15	111	1.95	85	1.65	54	.....	.....
14	1.5	42	1.8	69	2.15	111	1.9	79	1.65	54	.....	.....
15	1.5	42	1.85	74	2.15	111	1.8	69	1.6	50	.....	.....
16	1.5	42	1.85	74	2.15	111	1.8	69	1.6	50	.....	.....
17	1.5	42	1.85	74	2.15	111	1.8	69	1.6	50	.....	.....
18	1.5	42	1.85	74	2.15	111	1.8	69	1.6	50	.....	.....
19	1.6	50	1.85	74	2.15	111	1.75	64	1.7	59	.....	.....
20	1.6	50	1.85	74	2.15	111	1.75	64	1.7	59	.....	.....
21	1.6	50	1.85	74	2.0	91	1.85	74	1.7	59	.....	.....
22	1.65	54	1.85	74	2.0	91	1.7	59	1.7	59	.....	.....
23	1.65	54	2.0	91	1.95	85	1.75	64	1.7	59	.....	.....
24	1.65	54	2.0	91	2.0	91	1.7	59	1.7	59	.....	.....
25	1.75	64	2.05	98	1.95	85	1.7	59	1.7	59	.....	.....
26	1.75	64	2.05	98	2.05	98	1.7	59	1.7	59	.....	.....
27	1.75	64	2.05	98	2.05	98	1.7	59	1.7	59	.....	.....
28	1.75	64	2.05	98	2.05	98	1.7	59	1.7	59	.....	.....
29	1.75	64	2.05	98	2.0	91	1.7	59	1.7	59	.....	.....
30	1.75	64	2.1	104	2.0	91	1.65	54	1.7	59	.....	.....
31	.....	.....	2.15	111	.....	.....	1.65	54	1.7	59	.....	.....

NOTE.—Possibly some water running after gage readings were suspended Sept. 12; no record of the length of time the water ran.

Daily discharge determined from a well-defined rating curve.

Monthly discharge of Columbia Southern canal near Laidlaw, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	64	38	47.9	2,850	A.
May	111	64	77.3	4,750	A.
June	118	85	105	6,250	A.
July	91	54	74.4	4,570	A.
August	59	50	55.6	3,420	A.
Sept. 1-11	64	59	59.5	1,300	A.
The period	118	38	71.1	23,100	

KLICKITAT RIVER BASIN.

GENERAL FEATURES.[1]

Klickitat River drains the eastern slope of the southern portion of the Cascade Range in Washington.

The river rises in Goat Mountain, at an elevation of 8,500 feet above the sea, flows generally southward, paralleling the main range of the Cascades, and empties into Columbia River near the town of Lyle. The total length of the main stream is 105 miles. The principal tributaries, named in their order downstream, are, from the west, McCreedy Creek, West Fork, Cunningham Creek, Big Muddy River, Bacon Creek, and Outlet Creek; from the east, Diamond Fork,[2] Piscoe Creek, Surveyors Creek, White Creek, Little Klickitat River, and Swale Creek. The total drainage area is 1,160 square miles.

The most prominent feature of the area is Mount Adams, which crowns the summit of the divide at an elevation of 12,307 feet. The glaciers on this peak cover 2,300 acres. Those to the east supply the water in Big Muddy River and Little Muddy Creek during the summer months.

The soil of the area has resulted from the disintegration of the lavas and basalts, which are very porous and absorb large quantities of water. Thus the ground-storage capacity of the area is relatively high and the flow of the stream is uniform and well maintained. This natural tendency is further augmented by waters supplied by the glaciers on Mount Adams and the snow banks that stand in favored spots well into the summer.

The entire area, except the extreme eastern portion, is more or less covered with timber. On the west side of the river the growth is heavy, but it gradually thins out toward the eastern boundary of the basin.

So far as known the area contains no very large reservoir sites. Many small ones, however, could be developed in the swamps and lakes of the upland benches.

[1] A more detailed description of the general features of this basin is given in Water-Supply Paper U. S. Geol. Survey No. 272, pp. 410-413.

[2] Diamond Fork is locally known as Little Klickitat. It should not be confused with Little Klickitat River, the largest eastern tributary.

On account of the fairly steep grade, well-maintained flow, and rocky canyons through which Klickitat River and its tributaries flow, the system offers some exceptionally favorable opportunities for power development. West Fork and Big Muddy River offer some favorable opportunities for high-head developments. The grade of the main Klickitat is fairly uniform, averaging 44.5 feet to the mile for the 73 miles surveyed. Favorable sites for dams are numerous on the main stream, and the benches along the river in some places render construction of open canals entirely feasible. During the summer of 1909 the United States Geological Survey made a water-power survey of this basin.[1] Discharge measurements were made on all important tributaries and of the main river at various points.

KLICKITAT RIVER ABOVE GLENWOOD, WASH.

This station, which is located on the line between secs. 25 and 36, T. 10 N., R. 13 E., unsurveyed, about 800 feet above the mouth of Pearl Creek, was established May 31, 1910, by the Klickitat Irrigation & Power Co.

Discharge measurements were made with a K. & E. current meter from a foot log. The conditions for measurement were not of the best, the channel of the stream being rough and full of bowlders, but the measurements were carefully made and the results probably have a fairly high degree of accuracy. The results of measurements, record of gage heights, and determination of daily discharges have been furnished by the Klickitat Irrigation & Power Co. The computations of monthly discharge have been made by engineers of the United States Geological Survey.

Discharge measurements of Klickitat River above Glenwood, Wash., in 1910.

[By Klickitat Irrigation & Power Co.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Fee.*	*Sec.-ft.*
June 19	2.20	536	Oct. 14	1.25	185
20	2.00	453	17	1.20	179
23	1.80	373	19	1.25	192
25	1.80	373	21	1.20	182
29	1.70	324	24	1.20	178
July 1	1.70	322	26	1.25	188
5	1.65	315	28	1.20	180
7	1.60	322	Nov. 2	1.10	164
9	1.65	324	4	1.05	154
12	1.60	278	7	1.30	193
14	1.50	266	10	2.50	648
16	1.45	257	12	1.95	423
19	1.40	223	15	1.55	265
21	1.35	221	17	1.45	238
23	1.30	224	19	1.40	220
Oct. 6	1.50	247	22	2.15	500
8	1.55	260	29	1.55	263
11	1.30	205	Dec. 1	1.45	237

[1] For the results of this investigation including profiles of the rivers surveyed, see Stevens, J. C., Water powers of the Cascade Range, Part I, Southern Washington: Water Supply Paper U. S. Geol. Survey No. 253, 1910.

Daily gage height, in feet, of Klickitat River above Glenwood, Wash., for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.8	1.7	1.2	1.0	.....	1.15	1.45
2	.....	.....	1.65	1.2	.....	.....	1.1	1.4
3	.....	2.3	.....	1.15	1.0	.....	1.1	.....
4	.....	2.25	.....	1.15	.....	.....	1.05	.....
5	.....	.....	1.65	1.15	.....	.....	1.05	.....
6	.....	2.3	1.6	1.15	.....	1.5	.....	.....
7	.....	2.2	1.6	.....	1.0	1.55	1.3	.....
8	.....	2.1	1.65	1.15	1.0	1.55	1.5	.....
9	.....	2.0	1.65	1.15	1.0	.....	.....	.....
10	.....	2.0	.....	1.1	1.0	1.4	2.5	.....
11	.....	2.45	1.6	1.1	.....	1.3	2.0	.....
12	.....	.....	1.6	1.1	1.0	.....	1.95	.....
13	.....	2.1	1.55	1.1	1.0	1.3	.....	.....
14	.....	2.0	1.5	.....	1.0	1.25	1.6	.....
15	.....	2.1	1.5	1.1	1.0	1.2	1.55	.....
16	.....	2.0	1.45	1.1	1.0	.....	1.5	.....
17	.....	2.0	.....	1.1	1.0	1.2	1.45	.....
18	.....	1.95	1.4	1.1	.....	1.3	1.45	.....
19	.....	2.2	1.4	1.05	1.0	1.25	1.4	.....
20	.....	2.0	1.4	1.05	1.0	1.2	.....	.....
21	.....	1.9	1.35	.....	1.0	1.2	2.25	.....
22	.....	1.9	1.3	1.03	1.0	1.2	2.15	.....
23	.....	1.8	1.3	1.0	1.0	.....	2.05	.....
24	.....	1.7	.....	1.0	1.0	1.2	2.05	.....
25	.....	1.8	1.3	1.0	.....	1.2	1.80	.....
26	.....	.....	1.25	1.0	1.0	1.25	1.65	.....
27	.....	1.8	1.25	.....	1.0	1.2	.....	.....
28	.....	1.8	1.25	.....	1.0	1.2	1.4	.....
29	.....	1.7	1.25	1.0	.95	.....	1.55	.....
30	.....	1.7	1.2	1.0	.95	.....	1.4	.....
31	2.6	.....	.....	1.0	.....	1.15	.....	.....

Daily discharge, in second-feet, of Klickitat River above Glenwood, Wash., for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	767	334	179	148	142	170	238
2	.....	668	314	179	148	142	162	224
3	.....	570	314	170	148	142	162	.....
4	.....	551	314	170	148	255	155	.....
5	.....	560	314	170	148	255	155	.....
6	.....	570	294	170	148	255	177	.....
7	.....	531	294	170	148	274	199	.....
8	.....	492	314	170	148	274	255	.....
9	.....	453	314	170	148	249	452	.....
10	.....	453	304	162	148	224	649	.....
11	.....	630	294	162	148	199	453	.....
12	.....	561	294	162	148	199	424	.....
13	.....	492	274	162	148	199	359	.....
14	.....	453	255	162	148	188	294	.....
15	.....	492	255	162	148	179	274	.....
16	.....	453	238	162	148	179	256	.....
17	.....	453	231	162	148	179	238	.....
18	.....	433	224	162	148	199	238	.....
19	.....	531	224	155	148	188	224	.....
20	.....	453	224	155	148	179	388	.....
21	.....	413	210	154	148	179	551	.....
22	.....	413	199	152	148	179	511	.....
23	.....	374	199	148	148	179	472	.....
24	.....	334	199	148	148	179	472	.....
25	.....	374	199	148	148	179	373	.....
26	.....	374	188	148	148	188	314	.....
27	.....	374	188	148	148	179	269	.....
28	.....	374	188	148	148	179	224	.....
29	.....	334	188	148	142	176	274	.....
30	.....	334	179	148	142	173	224	.....
31	688	.....	179	148	.....	170	.....	.....

NOTE.—Daily discharge computed from a well-defined rating curve by the Klickitat Irrigation & Power Co.

Monthly discharge of Klickitat River above Glenwood, Wash., for 1910.

[Drainage area, 126 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.
June	767	334	475	3.77	4.21	28,300
July	334	179	250	1.98	2.28	15,400
August	179	148	160	1.27	1.46	9,840
September	148	142	148	1.18	1.32	8,810
October	274	142	195	1.55	1.79	12,000
November	649	155	312	2.48	2.77	18,600
The period						93,000

KLICKITAT RIVER NEAR GLENWOOD, WASH.

This station, which is located in the SW. ¼ sec. 11, T. 7 N., R. 12 E., at the intake of the proposed power canal of the Klickitat Valley Development Co., was established by William R. King, chief engineer of the company, by whom the records are furnished to the Geological Survey.

The river at this point shows considerable diurnal fluctuation during most of the year, caused by the melting of the glaciers at the head of Big Muddy and Hellroaring creeks. The earlier records are liable to some error on this account, but since the installation of a Friez automatic gage in July, 1910, this difficulty has been eliminated.

This station has not been visited by any engineer of the Geological Survey. The records are believed to be fully reliable.

Discharge measurements of Klickitat River near Glenwood, Wash., in 1909–1911.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1909.					
Oct. 29	Wm. R. King			0.65	466
Nov. 1	do			.60	458
1910.					
Jan. 18	Wm. R. King	70	233	.95	636
Feb. 12	do	72	226	.95	688
15	do	72	221	.87	644
16	do	72	215	.78	611
Apr. 14	do	76	294	2.00	1,650
July 17	do	72	221	1.15	811
Aug. 19	do	71	196	.74	600
Oct. 18	do	70	199	.78	571
Nov. 11	do	74	305	1.75	1,620
1911.					
Mar. 2	Wm. R. King	71	167	.40	360
13	do	74	172	.43	387
15	do	74	176	.52	441

Daily gage height, in feet, and discharge, in second-feet, of Klickitat River near Glenwood, Wash., for 1909.

[Klickitat Valley Development Co., observer.]

Day.	October.		November.		December.		Day.	October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			0.60	458	2.70	2,710	16				600	1.30	920
2			1.80	1,010	2.30	2,140	17				750	1.30	920
3			3.10	2,100	1.80	1,430	18				1,100	1.30	920
4				1,300	1.60	1,190	19				1,700	1.28	920
5				1,020	1.70	1,310	20				1,780	1.17	840
6				940	1.60	1,190	21				1,800	1.06	775
7				910	1.30	920	22				2,700	.61	550
8				870	1.50	1,090	23			4.20	4,830	.94	690
9				820	1.40	1,000	24			5.20	6,250	.94	690
10				750	1.30	920	25			3.30	3,550	1.22	855
11				680	1.70	1,310	26			2.60	2,560	.72	590
12				600	2.00	1,720	27			2.20	2,000	.50	520
13				600	1.60	1,190	28			2.30	2,140	1.00	715
14				600	1.30	920	29	0.65	466	2.60	2,560	.30	470
15				600	1.30	920	30			3.40	3,700	.28	463
							31					1.11	780

Daily gage height, in feet, of Klickitat River near Glenwood, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.33	1.25	1.59	1.89	2.30		1.18	0.87	0.62	0.60	0.58	0.84
2	.94	1.09	2.30	1.89	2.25			.86	.64	.78	.58	.92
3	.67	1.09	2.45	1.89	2.15	2.10		.86	.66	1.28	.57	1.04
4	.39	1.09	2.10	1.75	2.20			.84	.66	1.06	.56	.99
5	.61	1.09	2.00	1.75	2.25			.84	.66	.89	.56	.94
6	.50	1.09	1.74	1.80	2.35			.82	.61	.82	.57	.92
7	.39	1.06		1.76	2.5			.83	.58	.81	.82	.90
8	.50	.97	1.57	1.79		1.56		.84	.56	.84	.80	.89
9	.50	.99	1.51	1.80				.86	.56	.82	.92	.86
10	.50	.97	1.50	1.88	3.15		1.17	.86	.56	.76	1.47	.81
11	.33	.97	1.58	2.08				.80	.54	.70	1.62	.81
12	.28	.97	1.68	2.25	2.70		1.18	.80	.54	.70	1.28	.76
13	.33	.97	1.78	2.25	2.60	1.5		.78	.54	.66	1.08	.73
14	.61	.93	1.95	2.05	2.50			.73	.57	.64	.94	.71
15	.61	.90	2.15	2.05				.70	.57	.63	.85	.72
16	.61	.78	2.24	2.02				.69	.63	.63	.80	.75
17	.72	.88	2.50	2.10	2.18	1.39	1.15	.70	.60	.79	.76	.74
18	.90	.82	2.78	2.25				.71	.55	.74	.74	.73
19	.85	.84	3.05	2.50			1.00	.74	.55	.68	.69	.72
20	.72	.81	3.25	2.80			.98	.76		.66	1.04	.72
21	.90	.78	3.25	2.70	2.05	1.35	1.02	.74	.75	.65	1.60	.76
22	1.25	.72	3.25	2.60			.98	.72	.66	.62	1.41	.71
23	1.17		2.88	2.70			.98	.70	.64	.58	1.20	.85
24	.80	.86	2.75	3.00	2.40		.96	.67	.62	.62	1.04	.88
25	2.40	.89	2.40	3.20		1.19	.94	.67	.60	.68	.93	.80
26	2.20	.80	2.30	3.15			.92	.70	.60	.62	.93	.81
27	1.83	.85	2.20	2.95			.90	.68	.56	.59	.96	.78
28	1.63	.88	2.12	2.70	1.95		.90	.66	.60	.58	.92	.76
29	1.38		2.00	2.62			.90	.65	.63	.59	.89	.75
30	1.38		1.94	2.40			.91	.64	.60	.59	.86	.75
31	1.38		1.89		2.60		.88	.63		.58		.74

NOTE.—Gage heights, Oct. 29 to Nov. 3, 1909, taken at a point designated by Mr. King as Station 3; this gage, known as No. 3*a*, was washed out on the latter date.

Readings, Nov. 15, 1909, to Dec. 16, 1910, taken at Station No. 4. They were obtained on several staff gages, as follows:

No. 4x, Nov. 15 to Nov. 19, 1909; readings discarded, as they give erroneous results.

No. 4a, Nov. 23, 1909, to Jan. 29, 1910, reads same as No. 4x.

No. 4b, Jan. 29 to July 17, 1910, reads same as No. 4a.

No. 4d, July 19 to Dec. 16, 1910, at same location as No. 4b, but reads differently on account of stilling box for automatic gage, which was set by the readings of this gage. Gage read once a day, Oct. 29, 1909, to July 17, 1910, except Mar. 1 and 2, when two readings a day were made. Gage heights for July 19 to Dec. 16 are the means of the daily maximum and minimum stages as recorded on the automatic gage.

Readings for Dec. 17 to 31 observed at new station below Dairy Creek.

Daily discharge, in second-feet, of Klickitat River near Glenwood, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	940	880	1,200	1,550	2,140	1,760	822	679	511	493	474	654
2	680	770	2,140	1,550	2,070	1,810	822	668	523	641	474	753
3	570	770	2,350	1,550	1,980	1,860	822	672	538	1,054	470	805
4	490	770	1,860	1,370	2,000	1,720	822	657	543	828	466	772
5	550	770	1,720	1,370	2,070	1,560	822	656	538	695	457	733
6	520	770	1,350	1,430	2,210	1,430	816	649	500	648	470	713
7	490	750	1,260	1,370	2,420	1,290	816	650	482	638	643	700
8	520	695	1,160	1,430	2,730	1,150	816	655	466	663	635	695
9	520	710	1,100	1,430	3,040	1,140	816	674	468	641	722	669
10	520	695	1,100	1,550	3,340	1,130	816	668	458	595	1,292	638
11	475	695	1,170	1,830	3,020	1,110	822	628	451	570	1,445	638
12	463	695	1,280	2,080	2,710	1,100	822	628	447	562	1,049	604
13	475	695	1,400	2,080	2,550	1,090	822	609	451	541	845	585
14	550	670	1,650	1,790	2,420	1,060	816	586	472	518	730	570
15	550	660	1,930	1,790	2,270	1,040	816	568	472	515	665	577
16	550	611	2,050	1,740	2,120	1,010	810	560	514	516	626	597
17	590	648	2,420	1,860	1,970	990	810	565	496	627	604	532
18	659	623	2,810	2,070	1,920	980	792	571	454	593	589	528
19	635	630	3,150	2,420	1,870	980	774	591	454	558	558	519
20	590	620	3,490	2,840	1,830	970	755	662	516	540	855	520
21	659	611	3,490	2,700	1,780	960	791	592	598	529	1,415	545
22	880	590	3,490	2,570	1,950	930	755	577	540	504	1,192	513
23	820	590	2,960	2,700	2,110	900	756	565	523	482	961	608
24	617	638	2,780	3,130	2,280	860	749	545	504	511	809	623
25	2,280	652	2,280	3,410	2,120	820	726	545	488	550	723	573
26	2,000	617	2,140	3,340	1,960	828	714	560	492	512	723	580
27	1,470	635	2,000	3,060	1,800	828	708	551	462	487	742	567
28	1,230	648	1,890	2,710	1,650	826	703	533	492	482	713	547
29	980	.....	1,720	2,590	1,670	824	703	533	515	487	694	539
30	980	.....	1,630	2,280	1,700	824	710	525	492	487	673	540
31	980	.....	1,550	.....	1,720	.....	691	515	.....	478	.....	530

NOTE.—Daily discharge determined from three rating curves applicable as follows:
To readings on gage No. 3a, Oct. 29 to Nov. 3, curve not well defined.
To readings on gages Nos. 4a and 4b, from Nov. 23, 1909, to July 17, 1910, fairly well defined.
To readings on gage No. 4d, well defined.
Mean daily discharge, July 19 to Nov. 16, computed by averaging the discharges corresponding with the highest and lowest daily gage heights.
Discharge, Nov. 4 to 22, 1909, estimated by comparison with record at Klickitat; discharge interpolated for other days when the gage was not read.
Discharge, Dec. 17 to 31, 1910, obtained from discharge recorded at the new station below Dairy Creek.

Monthly discharge of Klickitat River near Glenwood, Wash., for 1909–10.

[Drainage area, 350 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1909.							
November	6,250	458	1,710	4.89	5.46	102,000	C.
December	2,710	463	1,020	2.91	3.36	62,700	B.
1910.							
January	2,280	463	782	2.23	2.57	48,100	B.
February	880	590	682	1.95	2.03	37,900	B.
March	3,490	1,100	2,020	5.77	6.65	124,000	B.
April	3,410	1,370	2,120	6.06	6.76	126,000	B.
May	3,340	1,650	2,170	6.20	7.15	133,000	B.
June	1,860	824	1,130	3.23	3.60	67,200	B.
July	822	691	782	2.23	2.57	48,100	B.
August	679	515	599	1.71	1.97	36,800	A.
September	598	447	495	1.41	1.57	29,500	A.
October	1,050	478	579	1.65	1.90	35,600	A.
November	1,440	457	757	2.16	2.41	45,000	A.
December	830	519	612	1.75	2.02	37,600	B.
The year	3,490	447	1,060	3.03	41.20	769,000	

KLICKITAT RIVER AT KLICKITAT, WASH.

This station, which is located at Klickitat, Wash., 14 miles above the mouth of the river, was established July 3, 1909, to obtain data for use in connection with power and irrigation projects.

The gage is a vertical staff fastened to an oak stump on the right bank in line with the post office.

Measurements are made from the Spokane, Portland & Seattle Railroad bridge, three-fourths mile above the gage.

The banks of the stream are high and rocky and will not overflow. The bed of the stream is composed of gravel and cobblestones and is fairly permanent.

There are no irrigable lands in the immediate vicinity of the station, but the waters may be diverted to higher lands bordering Columbia River.

Plans for diversion and storage of water to irrigate the high tablelands that lie between the Yakima and Columbia rivers, known as Horse Heaven Plateau, have been made. The construction of this canal will involve the expenditure of many millions of dollars, as a canal 119 miles long would have to be constructed before irrigable lands are reached; but the lands are exceedingly fertile and climatic conditions are favorable for intensive agriculture. The diversion point for this project would necessarily be some point in the vicinity of West Fork of Klickitat River, and considerable storage would have to be developed in order to provide a sufficient water supply.

Discharge measurements of Klickitat River at Klickitat, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 26	F. C. Ebert	103	358	3.50	2,880
Oct. 24	do	77	206	1.96	993
Dec. 19[a]	John Dubuis	115	460	2.21	1,230

[a] Measurement made from ferry.

Daily gage height, in feet, of Klickitat River at Klickitat, Wash., for 1910.

[Mrs. M. A. Young, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	4.15	7.1	3.9	3.8	3.3	2.4	2.1	1.85	1.8	1.85	2.3
2	2.4	3.8	8.4	3.8	3.7	3.25	2.4	2.05	1.85	1.8	1.8	2.45
3	2.2	3.7	7.8	3.95	3.7	3.2	2.4	2.1	1.85	2.4	1.8	3.15
4	2.35	3.5	7.4	3.8	3.8	3.1	2.35	2.0	1.85	2.5	1.8	2.95
5	2.6	3.5	7.1	3.75	3.8	3.0	2.35	2.0	1.85	2.3	1.8	2.8
6	2.4	3.4	5.95	3.8	3.8	3.0	2.4	2.05	1.85	2.0	1.8	2.7
7	2.4	3.3	5.6	3.8	3.9	2.9	2.35	2.05	1.85	2.05	1.95	2.75
8	2.4	3.2	5.4	3.8	4.0	2.8	2.4	2.05	1.8	2.05	2.1	2.85
9	2.4	3.15	5.3	3.8	4.2	2.8	2.45	2.1	1.8	2.05	2.1	2.8
10	2.35	3.1	5.1	3.8	4.4	2.8	2.45	2.1	1.8	2.0	2.3	2.6

Daily gage height, in feet, of Klickitat River at Klickitat, Wash., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	2.3	3.05	5.15	3.9	4.3	3.0	2.45	2.1	1.8	2.0	2.7	2.55
12	2.3	3.05	5.15	4.1	4.1	3.0	2.4	2.0	1.8	1.95	2.95	2.45
13	2.3	3.25	5.3	4.0	3.95	2.9	2.4	2.0	1.8	1.9	2.5	2.4
14	2.3	3.3	5.45	3.8	3.8	2.8	2.35	2.0	1.8	1.9	2.2	2.4
15	2.25	3.05	5.5	3.8	3.65	2.75	2.3	2.0	1.8	1.9	2.1	2.35
16	2.25	2.8	5.7	3.75	3.55	2.7	2.3	1.95	1.85	1.9	2.1	2.3
17	2.25	2.9	5.9	3.8	3.5	2.7	2.25	1.9	1.85	1.95	2.0	2.3
18	2.6	2.85	6.0	3.9	3.6	2.65	2.25	1.95	1.85	1.95	2.0	2.25
19	2.75	2.8	6.2	4.15	3.5	2.7	2.2	1.95	1.85	1.95	2.05	2.2
20	2.5	2.8	6.3	4.3	3.45	2.75	2.25	2.0	1.85	2.0	2.1	2.2
21	2.7	2.8	6.3	4.25	3.4	2.6	2.2	1.95	1.9	1.95	3.15	2.15
22	3.8	2.6	6.2	4.1	3.4	2.55	2.1	1.9	1.9	1.95	3.1	2.1
23	.....	2.65	5.6	4.2	3.5	2.5	2.15	1.9	1.95	1.95	3.0	2.1
24	.....	2.8	5.35	4.4	3.7	2.5	2.2	1.95	1.9	1.95	2.7	2.5
25	5.45	3.2	4.95	4.6	3.65	2.5	2.15	1.9	1.85	1.95	2.45	2.4
26	4.9	3.5	4.7	4.7	3.5	2.5	2.15	1.9	1.8	1.95	2.35	2.35
27	4.65	5.45	4.5	4.4	3.4	2.5	2.1	1.9	1.8	1.95	2.3	2.3
28	4.7	6.50	4.3	4.25	3.3	2.5	2.1	1.9	1.8	1.9	2.3	2.3
29	4.3	.....	4.15	4.05	3.25	2.45	2.1	1.85	1.8	1.85	2.3	2.25
30	4.8	.....	4.05	3.9	3.25	2.45	2.1	1.9	1.85	1.85	2.3	2.2
31	4.95	.....	4.0	.....	3.25	.....	2.1	1.9	.....	1.85	.....	2.15

NOTE.—River never freezes at this station. Water over the gage Jan. 23 and 24.

Daily discharge, in second-feet, of Klickitat River at Klickitat, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,580	3,820	8,250	3,450	3,300	2,600	1,460	1,130	882	835	882	1,350
2	1,460	3,300	10,200	3,300	3,160	2,540	1,460	1,080	882	835	835	1,520
3	1,240	3,160	9,300	3,520	3,160	2,470	1,460	1,130	882	1,460	835	2,400
4	1,400	2,880	8,700	3,300	3,300	2,340	1,400	1,030	882	1,580	835	2,140
5	1,700	2,880	8,250	3,230	3,300	2,210	1,400	1,030	882	1,350	835	1,950
6	1,460	2,740	6,520	3,300	3,300	2,210	1,460	1,080	882	1,030	835	1,820
7	1,460	2,600	6,000	3,300	3,450	2,080	1,400	1,080	882	1,080	980	1,880
8	1,460	2,470	5,700	3,300	3,600	1,950	1,460	1,080	835	1,080	1,130	2,020
9	1,460	2,400	5,550	3,300	3,900	1,950	1,520	1,130	835	1,080	1,130	1,950
10	1,400	2,340	5,250	3,300	4,200	1,950	1,520	1,130	835	1,030	1,350	1,700
11	1,350	2,280	5,320	3,450	4,050	2,210	1,520	1,130	835	1,030	1,820	1,640
12	1,350	2,280	5,320	3,750	3,750	2,210	1,460	1,030	835	980	2,140	1,520
13	1,350	2,540	5,550	3,600	3,520	2,080	1,460	1,030	835	930	1,580	1,460
14	1,350	2,600	5,780	3,300	3,300	1,950	1,400	1,030	835	930	1,240	1,460
15	1,300	2,280	5,850	3,300	3,090	1,880	1,350	1,030	835	930	1,130	1,400
16	1,300	1,950	6,150	3,230	2,950	1,820	1,350	980	882	930	1,130	1,350
17	1,300	2,080	6,450	3,300	2,880	1,820	1,300	930	882	980	1,030	1,350
18	1,700	2,020	6,600	3,450	3,020	1,760	1,300	980	882	980	1,030	1,300
19	1,880	1,950	6,900	3,820	2,880	1,820	1,240	980	882	980	1,080	1,240
20	1,580	1,950	7,050	4,050	2,810	1,880	1,300	1,030	882	1,030	1,130	1,240
21	1,820	1,950	7,050	3,980	2,740	1,700	1,240	980	930	980	2,400	1,180
22	3,300	1,700	6,900	3,750	2,740	1,640	1,130	930	930	980	2,340	1,130
23	8,100	1,760	6,000	3,900	2,880	1,580	1,180	930	980	980	2,210	1,130
24	6,600	1,950	5,620	4,200	3,160	1,580	1,240	980	930	980	1,820	1,580
25	5,780	2,470	5,020	4,500	3,090	1,580	1,180	930	882	980	1,520	1,460
26	4,950	2,880	4,650	4,650	2,880	1,580	1,180	930	835	980	1,400	1,400
27	4,580	5,780	4,350	4,200	2,740	1,580	1,130	930	835	980	1,350	1,350
28	4,650	7,350	4,050	3,980	2,600	1,580	1,130	930	835	930	1,350	1,350
29	4,050	.....	3,820	3,680	2,540	1,520	1,130	882	835	882	1,350	1,300
30	4,800	.....	3,680	3,450	2,540	1,520	1,130	930	882	882	1,350	1,240
31	5,020	.....	3,600	.....	2,540	.....	1,130	930	.....	882	.....	1,180

NOTE.—Daily discharge determined from a rating curve well defined except for the extreme high-water extension. Results for January and February are somewhat uncertain, as the change in channel indicated by the plotting of the 1909 and 1910 low-water measurements may have occurred during the March flood.

Discharge estimated Jan. 23 and 24.

Monthly discharge of Klickitat River at Klickitat, Wash., for 1910.

[Drainage area, 1,090 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.
January	8,100	1,240	2,670	2.45	2.82	164,000
February	7,350	1,700	2,730	2.50	2.60	152,000
March	10,200	3,600	6,110	5.61	6.47	376,000
April	4,650	3,230	3,630	3.33	3.72	216,000
May	4,200	2,540	3,140	2.88	3.32	193,000
June	2,600	1,520	1,920	1.76	1.96	114,000
July	1,520	1,130	1,320	1.21	1.40	81,200
August	1,130	882	1,010	.927	1.07	62,100
September	980	835	871	.799	.89	51,800
October	1,580	835	1,020	.936	1.08	62,700
November	2,400	835	1,330	1.22	1.36	79,100
December	2,400	1,130	1,520	1.39	1.60	93,500
The year	10,200	835	2,270	2.08	28.29	1,650,000

KLICKITAT RIVER AT WOLS FERRY, NEAR LYLE, WASH.

This station, which is located at Wols Ferry, in sec. 19, T. 3 N., R. 19 E., about 8 miles below the Klickitat station and 5 miles above the mouth of the stream at Lyle, was established May 27, 1907, by Frank C. Kelsey, engineer for Ham, Yearsley & Ryrie, of Spokane, through whose courtesy the records have been furnished complete to the Survey for publication. The records show the total discharge of the river except Silvias Creek, a very small stream, and are directly comparable with those at the Klickitat station, as the inflow between the two points is negligible. The station was discontinued in October, 1910.

Measurements were made from the ferry, or from the cable and car with which it has since been replaced. The channel at the station is permanent and the staff gage is solidly set. A measurement made by the Geological Survey in 1910 checks the rating curve obtained from measurements in 1907.

Discharge measurements of Klickitat River at Wols Ferry, near Lyle, Wash., in 1907 and 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1907.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 27	A. Z. Richards	170	651	1.45	3,170
Aug. 25	do	158	392	.03	1,240
Oct. 14	do	153	350	− .26	915
1910.					
Oct. 25	F. C. Ebert	98	347	− .20	1,020

Daily gage height, in feet, of Klickitat River at Wols Ferry, near Lyle, Wash., for 1907, 1909, and 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.								
1	.....	1.75	0.5	0.15	−0.05	−0.2	−0.25	0.05
2	.....	1.65	.55	.15	−.05	−.2	−.25	.0
3	.....	1.5	.50	.10	−.05	−.2	−.25	−.05
4	.....	1.4	.5	.1	−.05	−.2	−.25	−.05
5	.....	1.3	.45	.1	−.1	−.2	−.3	−.1
6	.....	1.25	.45	.05	−.1	−.2	−.3	−.1
7	.....	1.15	.4	.05	−.1	−.2	−.3	−.1
8	.....	1.05	.4	.05	−.1	−.2	−.3	−.1
9	.....	1.05	.45	0	−.05	−.2	−.3	−.1
10	.....	1.0	.4	0	−.05	−.2	−.3	−.1
11	.....	.95	.35	0	−.05	−.25	−.3	−.15
12	.....	.9	.35	0	−.1	−.25	−.3	.15
13	.....	.85	.3	0	−.15	−.25	−.3	.3
14	.....	.8	.3	0	−.15	−.25	−.3	.3
15	.....	.7	.3	0	−.15	−.25	−.3	.1
16	.....	.7	.3	−.05	−.15	−.25	−.3	.0
17	.....	.65	.25	−.05	−.15	−.25	−.3	−.05
18	.....	.65	.25	−.05	−.15	−.25	−.3	−.05
19	.....	.7	.2	−.05	−.2	−.25	−.3	−.1
20	.....	.75	.2	0	−.2	−.25	−.25	−.1
21	.....	.75	.2	0	−.2	−.25	−.25	−.05
22	.....	.65	.2	.05	−.2	−.25	−.2	.35
23	.....	.6	.15	.05	−.2	−.25	−.2	.45
24	.....	.65	.15	.05	−.2	−.25	.35	.7
25	.....	.6	.15	.05	−.2	−.25	.4	1.7
26	.....	.6	.15	.05	−.2	−.25	.55	2.65
27	1.45	.65	.15	0	−.2	−.25	0	1.45
28	1.5	.7	.15	0	−.2	−.25	0	1.15
29	1.55	.75	.15	0	−.2	−.25	.05	1.05
30	1.65	.65	.15	.05	−.2	−.25	.05	.85
31	1.7	.....	.15	−.05	.....	−.25	.....	.8

Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.
1909.		1909.		1909.		1909.		1909.		1909.	
1	.....	6	.....	11	.....	16	1.2	21	0.75	26	0.35
2	.....	7	.....	12	1.35	17	1.15	22	.60	27	.3
3	.....	8	.....	13	1.7	18	1.1	23	.55	28	.25
4	.....	9	.....	14	1.45	19	1.1	24	.5	29	.2
5	.....	10	.....	15	1.3	20	.9	25	.45	30	.2
										31	.15

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1910.										
1	0.15	1.75	4.85	1.70	1.65	0.75	0.10	−0.05	−0.15	−0.25
2	.15	1.45	5.40	1.65	1.45	.75	.1	.0	−.15	.....
3	.05	1.35	5.85	1.6	1.35	.7	.15	.0	−.15	.....
4	−.10	1.25	4.9	1.55	1.3	.7	.15	.0	−.15	.....
5	−.15	1.2	4.15	1.45	1.25	.65	.2	.0	−.15	.....
6	−.2	1.15	3.95	1.4	1.2	.65	.2	−.05	−.15	.....
7	−.15	1.05	3.8	1.35	1.15	.6	.25	−.05	−.15	.....
8	−.15	.95	3.75	1.25	1.25	.6	.25	−.05	−.15	.....
9	−.1	.85	3.7	1.2	1.45	.55	.3	−.05	−.15	.....
10	−.1	.9	3.6	1.25	1.55	.55	.3	−.05	−.15	.....
11	−.15	1.05	3.6	1.3	1.65	.55	.3	−.05	−.15	.....
12	−.15	1.15	3.55	1.3	1.6	.65	.35	−.1	−.2	.....
13	−.2	1.15	3.35	1.35	1.35	.7	.3	−.1	−.2	.....
14	−.2	1.2	3.15	1.35	1.2	.75	.3	−.1	−.2	.....
15	−.25	1.25	3.05	1.3	1.2	.65	.25	−.1	−.2	.....
16	−.25	1.15	3.15	1.3	1.15	.6	.25	−.1	−.2	.....
17	−.20	1.05	3.25	1.35	1.15	.55	.25	−.1	−.2	.....
18	−.15	.95	3.3	1.4	1.1	.55	.2	−.1	−.2	.....
19	−.1	.9	3.45	1.5	1.1	.5	.2	−.1	−.2	.....
20	.1	.95	3.4	1.55	1.05	.45	.15	−.1	−.2	.....
21	.5	.95	3.35	1.6	1.05	.4	.1	−.1	−.2	.....
22	1.25	.9	3.2	1.65	.95	.4	.1	−.1	−.15	.....
23	3.1	.85	2.75	1.7	.85	.35	.05	−.1	−.15	.....
24	4.45	.85	2.5	1.85	.7	.3	.05	−.1	−.15	.....
25	3.2	.95	2.25	2.05	.6	.3	.05	−.1	−.15	.....
26	2.45	1.1	2.1	2.15	.55	.25	0	−.1	−.2	.....
27	2.7	2.25	2.05	2.2	.45	.25	0	−.1	−.2	.....
28	2.35	3.9	1.9	2.05	.3	.20	−.05	−.1	−.2	.....
29	1.8	.....	1.85	1.9	.45	.2	−.05	−.1	−.2	.....
30	2.1	.....	1.8	1.85	.55	.15	−.05	−.15	−.25	.....
31	2.45	.....	1.75	.....	.6	.....	−.05	−.15	.....	.....

NOTE.—Gage heights January, 1908, to November, 1909, are published in Water-Supply Papers, U. S. Geol. Survey Nos. 253, p. 39, and 272, pp. 416–417.

Daily discharge, in second-feet, of Klickitat River at Wols Ferry, near Lyle, Wash., for 1907–1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.								
1	.....	3,590	1,840	1,375	1,135	975	925	1,250
2	.....	3,450	1,910	1,375	1,135	975	925	1,190
3	.....	3,240	1,840	1,310	1,135	975	925	1,135
4	.....	3,100	1,840	1,310	1,135	975	925	1,135
5	.....	2,960	1,770	1,310	1,080	975	875	1,080
6	.....	2,890	1.770	1,250	1,080	975	875	1.080
7	.....	2,750	1,700	1,250	1,080	975	875	1,080
8	.....	2,610	1,700	1,250	1,080	975	875	1,080
9	.....	2,610	1,770	1,190	1,135	975	875	1,080
10	.....	2,540	1,700	1,190	1,135	975	875	1,080
11	.....	2,470	1,635	1,190	1,135	925	875	1,025
12	.....	2,400	1,635	1,190	1,080	925	875	1,375
13	.....	2,330	1,570	1,190	1,025	925	875	1,570
14	.....	2,260	1,570	1,190	1,025	925	875	1,570
15	.....	2,120	1,570	1,190	1,025	925	875	1,310
16	.....	2,120	1,570	1,135	1,025	925	875	1,190
17	.....	2,050	1,505	1,135	1,025	925	875	1,135
18	.....	2,050	1,505	1,135	1,025	925	875	1,135
19	.....	2,120	1,440	1,135	975	925	875	1,080
20	.....	2,190	1,440	1,190	975	925	925	1,080
21	.....	2,190	1,440	1,190	975	925	925	1,135
22	.....	2,050	1,440	1,250	975	925	975	1,635
23	.....	1,980	1,375	1,250	975	925	975	1,770
24	.....	2,050	1,375	1,250	975	925	1,635	2,120
25	.....	1,980	1,375	1,250	975	925	1,700	3,520
26	.....	1,980	1,375	1,250	975	925	1,910	4,850
27	3,170	2,050	1,375	1,190	975	925	1,190	3,170
28	3,240	2,120	1,375	1,190	975	925	1,190	2,750
29	3,310	2,190	1,375	1,190	975	925	1,250	2,610
30	3,450	2,050	1,375	1,250	975	925	1,250	2,330
31	3,520	.....	1,375	1,135	.....	925	.....	2,260

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1908.											
1	2,120	975	1,700	2,190	2,920	2,680	2,330	.....	.....	.....	.....
2	1,910	1,025	1,770	2,120	2,870	2,540	2,330	.....	.....	.....	.....
3	1,770	1,080	1,700	2,120	2,820	2,470	2,400	.....	.....	.....	.....
4	1,700	1,190	1,635	2,190	2,890	2,470	2,260	.....	.....	.....	.....
5	1,635	1,310	1,635	2,190	2,890	2,470	2,120	.....	.....	.....	.....
6	1,570	1,700	1,570	2,120	2,960	2,540	2,050	.....	.....	.....	.....
7	1,570	1,440	1,570	2,050	2,960	2,750	2,120	.....	.....	.....	.....
8	1,635	1,310	1,505	1,980	2,890	3,030	2,120	.....	.....	.....	.....
9	2,120	1,570	1,505	2,050	2,890	3,170	2,120	.....	.....	.....	780
10	2,050	1,840	1,440	2,120	2,820	3,380	2,190	.....	.....	.....	.....
11	1,910	1,770	1,440	2,190	2,750	3,450	2,120	.....	.....	825	.....
12	1,840	1,700	1,635	2,400	2,680	3,380	2,120	.....	.....	.....	.....
13	1,840	1,570	1,770	2,610	2,610	3,240	2,190	.....	.....	.....	.....
14	1,770	1,440	3,030	2,750	2,540	3,030	2,120	.....	.....	.....	.....
15	1,635	1,375	3,800	2,680	2,680	2,960	2,050	.....	.....	.....	.....
16	1,570	1,310	4,920	2,750	2,890	2,890	1,980	.....	.....	.....	.....
17	1,840	1,375	4,990	3,100	2,890	2,750	1,910	.....	.....	.....	.....
18	1,770	1,440	4,570	3,730	2,820	2,610	1,770	.....	.....	.....	.....
19	1,910	1,505	3,800	4,150	2,820	2,540	1,770	.....	.....	.....	.....
20	2,050	1,570	3,310	4,080	2,750	2,400	1,770	.....	.....	.....	.....
21	1,980	1,505	3,030	3,800	2,680	2,330	1,770	.....	.....	.....	.....
22	1,700	1,440	3,030	3,450	2,610	2,190	1,700	.....	.....	.....	.....
23	1,570	1,440	2,960	3,380	2,540	1,980	1,700	.....	.....	.....	.....
24	1,505	1,570	2,890	3,310	2,750	2,050	1,700	.....	.....	.....	.....
25	1,505	1,570	2,890	3,170	2,820	2,190	1,635	.....	.....	780	.....
26	1,440	1,635	2,820	3,120	2,890	2,330	1,600	.....	.....	.....	.....
27	1,375	1,700	2,750	3,070	2,890	2,330	1,550	.....	.....	.....	.....
28	1,310	1,770	2,680	3,020	2,890	2,260	1,500	.....	.....	.....	780
29	1,250	1,635	2,540	2,970	2,890	2,330	1,450	.....	.....	.....	.....
30	1,080	.....	2,400	2,920	2,890	2,330	1,400	.....	.....	.....	.....
31	1,025	.....	2,330	.....	2,820	.....	1,350	.....	.....	.....	.....

Daily discharge, in second-feet, of Klickitat River at Wols Ferry, near Lyle, Wash., for 1907–1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	.....	1,700	2,890	2,610	2,400	3,380	1,700	1,250	1,025	925	1,025	4,730
2	.....	2,050	2,960	2,540	2,540	3,730	1,700	1,250	1,025	925	1,375	4,130
3	.....	2,260	2,820	2,470	2,750	3,660	1,700	1,310	1,025	875	2,190	3,530
4	.....	2,050	2,610	2,400	3,030	3,520	1,700	1,310	1,080	875	2,750	3,090
5	.....	2,190	2,470	2,330	3,170	3,450	1,700	1,310	1,080	875	2,050	2,840
6	.....	2,050	2,330	2,190	3,030	3,100	1,840	1,375	1,080	875	1,840	2,740
7	.....	1,910	2,190	2,120	2,890	2,960	1,770	1,375	1,025	875	1,770	2,530
8	.....	1,770	2,120	2,120	2,750	2,820	1,700	1,310	1,025	875	1,635	2,530
9	.....	1,700	2,050	2,190	2,680	2,750	1,700	1,310	1,025	875	1,505	2,390
10	.....	1,635	2,050	2,330	2,610	2,680	1,635	1,250	975	875	1,310	2,260
11	.....	1,505	1,980	2,400	2,540	2,680	1,635	1,250	975	875	1,250	2,230
12	.....	1,570	2,050	2,540	2,400	2,610	1,635	1,190	975	875	1,190	3,030
13	.....	1,700	2,120	2,610	2,400	2,680	1,570	1,135	975	875	1,190	3,520
14	.....	1,770	2,190	2,680	2,470	2,610	1,570	1,135	975	875	1,025	3,170
15	.....	1,910	2,330	2,610	2,470	2,540	1,505	1,080	975	875	875	2,960
16	.....	2,470	2,400	2,540	2,470	2,540	1,505	1,080	975	875	875	2,820
17	.....	3,730	2,470	2,610	2,540	2,610	1,440	1,025	975	875	925	2,750
18	.....	4,290	2,610	2,610	2,540	2,680	1,440	1,025	975	875	1,080	2,680
19	.....	3,870	2,470	2,540	2,610	2,610	1,440	975	925	875	3,170	2,680
20	.....	3,450	2,400	2,610	2,680	2,470	1,375	1,080	925	875	3,590	2,400
21	.....	3,030	2,330	2,470	2,750	2,400	1,440	1,135	925	875	2,560	2,190
22	.....	2,750	2,260	2,330	2,680	2,260	1,505	1,135	925	875	4,000	1,980
23	.....	2,610	2,120	2,330	2,610	2,190	1,440	1,135	875	875	6,000	1,910
24	2,470	3,030	2,190	2,400	2,680	2,120	1,440	1,080	875	875	6,000	1,840
25	2,330	3,170	2,260	2,540	2,750	2,050	1,440	1,080	875	875	5,520	1,770
26	2,120	2,750	2,260	2,610	3,030	1,980	1,440	1,080	925	875	4,430	1,635
27	2,050	2,680	2,330	2,750	3,170	1,910	1,375	1,025	925	875	3,760	1,570
28	1,840	2,610	2,470	2,610	3,310	1,840	1,375	1,025	925	875	3,980	1,505
29	1,635	.....	2,610	2,540	3,100	1,770	1,310	975	975	875	4,660	1,440
30	1,570	.....	2,750	2,400	3,170	1,770	1,310	975	975	875	5,680	1,440
31	1,570	.....	2,750	.....	3,310	.....	1,250	975	.....	925	.....	1,375

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1910.										
1	1,375	3,590	7,930	3,520	3,450	2,190	1,310	1,135	1,025	925
2	1,375	3,170	8,700	3,450	3,170	2,190	1,310	1,190	1,025	.....
3	1,250	3,030	9,330	3,380	3,030	2,120	1,375	1,190	1,025	.....
4	1,080	2,890	8,000	3,310	2,960	2,120	1,375	1,190	1,025	.....
5	1,025	2,820	6,950	3,170	2,890	2,050	1,440	1,190	1,025	.....
6	975	2,750	6,670	3,100	2,820	2,050	1,440	1,135	1,025	.....
7	1,025	2,610	6,460	3,030	2,750	1,980	1,505	1,135	1,025	.....
8	1,025	2,470	6,390	2,890	2,890	1,980	1,505	1,135	1,025	.....
9	1,080	2,330	6,320	2,820	3,170	1,910	1,570	1,135	1,025	.....
10	1,080	2,400	6,180	2,890	3,310	1,910	1,570	1,135	1,025	.....
11	1,025	2,610	6,180	2,960	3,450	1,910	1,570	1,135	1,025	.....
12	1,025	2,750	6,110	2,960	3,380	2,050	1,635	1,080	975	.....
13	975	2,750	5,830	3,030	3,030	2,120	1,570	1,080	975	.....
14	975	2,820	5,550	3,030	2,820	2,190	1,570	1,080	975	.....
15	925	2,890	5,410	2,960	2,820	2,050	1,505	1,080	975	.....
16	925	2,750	5,550	2,960	2,750	1,980	1,505	1,080	975	.....
17	975	2,610	5,690	3,030	2,750	1,910	1,505	1,080	975	.....
18	1,025	2,470	5,760	3,100	2,680	1,910	1,440	1,080	975	.....
19	1,080	2,400	5,970	3,240	2,680	1,840	1,440	1,080	975	.....
20	1,310	2,470	5,900	3,310	2,610	1,770	1,375	1,080	975	.....
21	1,840	2,470	5,830	3,380	2,610	1,700	1,310	1,080	975	.....
22	2,890	2,400	5,620	3,450	2,470	1,700	1,310	1,080	1,025	.....
23	5,480	2,330	4,990	3,520	2,330	1,635	1,250	1,080	1,025	.....
24	7,370	2,330	4,640	3,730	2,120	1,570	1,250	1,080	1,025	.....
25	5,620	2,470	4,290	4,010	1,980	1,570	1,250	1,080	1,025	.....
26	4,570	2,680	4,080	4,150	1,910	1,505	1,190	1,080	975	.....
27	4,920	4,290	4,010	4,220	1,770	1,505	1,190	1,080	975	.....
28	4,430	6,600	3,800	4,010	1,570	1,440	1,135	1,080	975	.....
29	3,660	.....	3,730	3,800	1,770	1,440	1,135	1,080	975	.....
30	4,080	.....	3,660	3,730	1,910	1,375	1,135	1,025	925	.....
31	4,570	.....	3,590	.....	1,980	.....	1,135	1,025	.....	.....

NOTE.—Daily discharge computed by F. C. Kelsey, engineer for Ham, Yearsley & Ryrie from rating curve well defined between 900 and 3,000 second-feet. Discharges for the period Nov. 21 to Dec. 11, 1909, were estimated as being the same as at Klickitat.

Monthly discharge of Klickitat River at Wols Ferry, near Lyle, Wash., for 1907–1910.

[Drainage area, 1,140 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.
1907.						
May 27–31	3,520	3,170	3,340	2.93	0.54	33,100
June	3,590	1,980	2,420	2.12	2.36	144,000
July	1,910	1,380	1,570	1.38	1.59	96,500
August	1,380	1,140	1,220	1.07	1.23	75,000
September	1,140	975	1,040	.912	1.05	61,900
October	975	925	941	.825	.95	57,900
November	1,910	875	1,020	.895	1.03	60,700
December	4,850	1,020	1,670	1.46	1.68	103,000
The period						632,000
1908.						
January	2,120	1,020	1,680	1.47	1.70	103,000
February	1,840	975	1,470	1.29	1.39	84,600
March	4,990	1,440	2,570	2.25	2.64	158,000
April	4,150	1,980	2,790	2.45	2.73	166,000
May	2,960	2,540	2,810	2.46	2.84	173,000
June	3,450	1,980	2,640	2.32	2.59	157,000
July	2,400	1,350	1,910	1.68	1.94	117,000
The period						959,000
1909.						
January 24–31	2,470	1,570	1,950	1.71	.51	30,900
February	4,290	1,500	2,440	2.14	2.23	136,000
March	2,890	1,980	2,380	2.09	2.41	146,000
April	2,750	2,120	2,470	2.17	2.42	147,000
May	3,310	2,400	2,760	2.42	2.79	170,000
June	3,730	1,770	2,610	2.29	2.56	155,000
July	1,840	1,250	1,540	1.35	1.56	94,700
August	1,380	975	1,150	1.01	1.16	70,700
September	1,080	875	974	.854	.95	58,000
October	925	875	880	.772	.89	54,100
November	[a] 6,000	875	2,640	2.32	2.59	157,000
December	[a] 4,730	1,380	2,510	2.20	2.54	154,000
The period						1,380,000
1910.						
January	7,370	925	2,290	2.01	2.32	141,000
February	6,600	2,330	2,860	2.51	2.61	159,000
March	9,330	3,590	5,780	5.07	5.84	355,000
April	4,220	2,820	3,340	2.93	3.27	199,000
May	3,450	1,570	2,640	2.32	2.68	162,000
June	2,190	1,380	1,860	1.63	1.82	111,000
July	1,640	1,190	1,380	1.21	1.40	84,800
August	1,190	1,020	1,100	.965	1.11	67,600
September	1,020	925	998	.876	.98	59,400
The period						1,340,000

[a] Estimated as same as station at Klickitat.

NOTE.—The accuracy of the figures for monthly discharge may be rated as B or, for certain periods, somewhat better.

WEST FORK OF KLICKITAT RIVER NEAR GLENWOOD, WASH.

This station, which is located near the southwest corner of sec. 10, T. 19 N., R. 12 E., just below the junction of Little Muddy Creek and Fish Lake Stream, about 500 feet above the intake of the proposed West Fork canal of the Klickitat Irrigation & Power Co., was established June 17, 1910.

The method of making measurements and the conditions at the station are similar to those at the station on the main river above Pearl Creek. The elevation of the zero of the gage is 2,988.89 feet.

Records of measurements, gage readings, and computations of daily discharge were furnished by the Klickitat Irrigation & Power Co. The monthly discharge has been computed by the engineers of the United States Geological Survey.

Discharge measurements of West Fork of Klickitat River near Glenwood, Wash., in 1910.

[By Klickitat Irrigation & Power Co.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 23	2.25	422	Oct. 20	1.75	282
27	2.10	427	22	1.75	269
30	2.05	407	25	1.85	294
July 2	2.05	383	27	1.80	297
8	2.05	391	Nov. 1	1.70	271
11	2.00	368	3	1.75	281
13	1.90	353	5	1.75	284
15	2.00	368	8	1.90	321
18	1.90	314	11	2.80	670
20	1.90	336	14	2.10	405
22	1.90	321	16	1.90	344
25	1.85	308	18	1.85	320
Oct. 7	1.95	331	21	2.75	663
10	1.80	302	23	2.40	527
13	1.80	298	28	2.00	364
15	1.80	290	30	1.90	343
18	1.80	289			

Daily gage height, in feet, and discharge, in second-feet, of West Fork of Klickitat River near Glenwood, Wash., for 1910.

Day.	June.		July.		August.		September.		October.		November.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.05	390	1.85	314	1.75	276	.....	257	1.7	257
2	.....	.....	2.05	390	1.85	314	.....	276	.....	257	1.7	257
3	.....	.....	.....	384	1.85	314	1.75	276	.....	257	1.75	276
4	.....	.....	.....	377	1.8	295	.....	276	.....	352	1.75	276
5	.....	.....	2.0	371	1.8	295	.....	276	.....	352	1.75	276
6	.....	.....	2.0	371	1.8	295	.....	276	1.95	352	.....	286
7	.....	.....	2.0	371	.....	304	1.75	276	1.95	352	1.8	295
8	.....	.....	2.05	390	1.85	314	1.75	276	2.00	371	1.9	333
9	.....	.....	2.1	410	1.85	314	1.75	276	.....	333	.....	542
10	.....	.....	.....	390	1.8	295	1.75	276	1.80	295	3.0	752
11	.....	.....	2.0	371	1.8	295	.....	276	1.75	276	2.8	676
12	.....	.....	2.0	371	1.8	295	1.75	276	.....	286	2.6	600
13	.....	.....	1.9	333	1.8	295	1.75	276	1.80	295	.....	505
14	.....	.....	2.0	371	.....	295	1.75	276	1.80	295	2.1	410
15	.....	.....	2.0	371	1.8	295	1.75	276	1.80	295	2.0	371
16	.....	.....	1.95	352	1.8	295	1.75	276	.....	295	1.9	333
17	2.3	486	.....	342	1.8	295	1.75	276	1.80	295	1.9	333
18	2.3	486	1.9	333	1.8	295	.....	276	1.80	295	1.85	314
19	2.3	486	1.9	333	1.8	295	1.75	276	1.80	295	1.85	314
20	2.4	524	1.9	333	1.8	295	1.75	276	1.75	276	.....	486
21	2.4	524	1.9	333	.....	295	1.75	276	1.75	276	2.75	657
22	2.35	505	1.9	333	1.8	295	1.75	276	1.75	276	2.5	562
23	2.25	466	1.85	314	1.8	295	1.75	276	.....	286	2.4	524
24	2.25	466	.....	314	1.8	295	1.75	276	1.80	295	2.2	447
25	2.2	447	1.85	314	1.8	295	.....	272	1.85	314	2.1	410
26	.....	428	1.85	314	1.75	276	1.73	268	1.85	314	2.0	371
27	2.1	410	1.85	314	1.75	276	1.7	257	1.8	295	.....	371
28	2.1	410	1.85	314	.....	276	1.7	257	1.8	295	2.0	371
29	2.05	390	1.8	295	1.75	276	1.7	257	.....	282	1.95	352
30	2.05	390	1.8	295	1.75	276	1.7	257	.....	270	1.9	333
31	.....	.....	.....	304	1.75	276	.....	.....	1.7	257	.....	.....

NOTE.—Daily discharge computed by the Klickitat Irrigation & Power Co. from a well-defined rating curve.

Monthly discharge of West Fork of Klickitat River near Glenwood, Wash., for 1910.

[Drainage area, 83 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.
June 17-30	524	390	458	5.52	2.87	12,700
July	410	295	348	4.19	4.83	21,400
August	314	276	295	3.55	4.09	18,100
September	276	257	273	3.29	3.67	16,200
October	371	257	298	3.59	4.14	18,300
November	752	257	410	4.94	5.51	24,400
The period						111,000

LITTLE KLICKITAT RIVER NEAR GOLDENDALE, WASH.

This station, which is located in sec. 10, T. 4 N., R. 16 E., at the county highway bridge on Hanging Rock ranch, 2½ miles above Goldendale, Wash., was established June 25, 1910.

Gage heights are never seriously affected by ice.

The following discharge measurement was made by John Dubuis:

December 17, 1910: Width, 37 feet; area, 35.8 square feet; gage height, 1.40 feet; discharge, 48.6 second-feet.

Daily gage height, in feet, of Little Klickitat River near Goldendale, Wash., in 1910.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1			1.38	11		1.28	1.75	21			
2			1.42	12		1.18	1.68	22			1.30
3	1.30		1.96	13		1.12	1.65	23		1.55	1.72
4	1.30		1.85	14		1.11	1.50	24		1.32	1.62
5	1.05		1.26	15			1.45	25		1.44	1.52
6	1.10		1.21	16			1.45	26		1.40	1.55
7			1.25	17			1.45	27		1.40	1.52
8		1.05	1.58	18			1.35	28		1.36	1.50
9		1.12	1.79	19			1.32	29		1.35	1.48
10	1.00	1.30	1.70	20			1.32	30		1.36	1.48
								31			

NOTE.—No ice at this station during period covered by the records.

HOOD RIVER BASIN.

GENERAL FEATURES.

Hood River, which drains the northern slopes of Mount Hood, is formed by the junction of its East and West forks, which head on opposite sides of the mountain; it flows northeastward into Columbia River at Hood River.

The stream is used for power development and for irrigation, and being supplied from glaciers on the mountain, the flow is well maintained through the summer months.

The drainage basin is heavily forested although part of it was burned over many years ago. The mean annual precipitation at Hood River is 36 inches.

HOOD RIVER AT WINANS, OREG.

This gaging station, which is located 300 feet below the junction of the East and West forks at Winans, 10½ miles above Hood River, Oreg., was established November 17, 1905, discontinued March 31, 1907, and reestablished January 16, 1910, in cooperation with W. R. Winans.

When readings were resumed they were referred to a gage datum 0.50 foot higher than that previously used.

The channel is practically permanent and an excellent rating curve has been obtained for all except extreme high stages.

The following measurement was made by Ebert and Davenport:

July 26, 1910: Width, 90 feet; area, 264 square feet; gage height, 0.30 foot; discharge, 638 second-feet.

Daily gage height, in feet, of Hood River at Winans, Oreg., for 1910.

[W. Ross Winans, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.8	5.1	1.7	1.2	0.9	0.5	0.3	0.0	0.1	0.3	2.0
2	.....	1.5	5.2	1.9	1.4	1.0	.5	.3	0	.9	.3	1.8
3	.....	1.4	4.7	1.9	1.7	.8	.5	.3	0	1.0	.4	1.7
4	.....	1.3	4.2	1.8	2.1	.8	.5	.3	0	1.0	.4	1.6
5	.....	1.1	3.1	1.6	2.2	.8	.5	.2	0	.7	.4	1.6
6	.....	1.1	2.9	1.6	1.9	.7	.6	.2	.1	.5	1.0	1.8
7	.....	1.1	2.9	1.7	1.8	.6	.5	.2	.1	.4	1.6	1.6
8	.....	.9	2.8	2.0	1.7	.7	.5	.2	.1	.3	2.0	1.8
9	.....	.9	2.5	1.9	1.8	.7	.5	.2	.1	.3	3.0	2.0
10	.....	.9	2.3	1.7	2.1	.8	.6	.3	.1	.2	3.6	2.0
11	.....	.8	2.2	1.8	2.0	.9	.6	.3	.1	.2	3.0	1.8
12	.....	.8	2.2	1.7	1.8	1.0	.6	.3	.1	.2	2.6	1.6
13	.....	1.5	2.1	1.7	1.8	.9	.5	.3	0	.2	2.4	1.4
14	.....	1.1	2.1	1.5	1.7	.8	.5	.3	0	.2	2.4	1.2
15	.....	1.0	2.5	1.4	1.5	.8	.5	.3	.1	.2	2.4	1.1
16	0.9	.9	2.5	1.4	1.4	.6	.5	.3	.1	.1	2.3	1.0
17	2.0	1.0	2.7	1.6	1.4	.6	.5	.3	.2	.1	2.2	.8
18	1.1	.9	2.5	1.6	1.4	.6	.4	.3	.2	.1	2.0	.9
19	1.0	.9	2.5	1.7	1.2	.7	.4	.3	.2	.1	2.0	1.0
20	.8	1.0	2.5	1.8	1.2	.6	.4	.3	.1	.1	1.9	1.0
21	.8	.9	2.5	1.8	1.3	.6	.4	.3	.1	.1	1.6	.9
22	1.9	.9	2.2	1.8	1.3	.6	.4	.3	.1	.1	1.5	.9
23	3.1	.8	2.2	2.0	1.2	.5	.3	.3	.1	.2	1.4	.8
24	3.0	.9	2.1	2.1	1.3	.5	.3	.3	.1	.2	1.2	.8
25	2.2	1.1	1.9	2.2	1.1	.5	.3	.3	.1	.2	1.2	.8
26	1.9	1.7	2.0	2.3	1.1	.6	.3	.3	.1	.2	1.2	.8
27	1.7	2.6	1.7	2.2	1.1	.5	.3	.3	.1	.2	1.3	.9
28	1.7	3.1	1.7	2.0	1.1	.5	.3	.2	.1	.2	1.3	.9
29	1.6	.....	1.6	1.8	1.0	.5	.3	.2	.1	.2	1.4	.8
30	1.6	.....	1.6	1.4	1.1	.6	.3	.1	.1	.2	1.8	.8
31	2.0	.....	1.7	.....	1.1	.....	.3	.1	.....	.3	.....	.8

NOTE.—Gage heights refer to a datum 0.5 foot higher than that used in 1905 to 1907. No ice at this station.

Daily discharge, in second-feet, of Hood River at Winans, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,860	5,370	1,770	1,320	1,080	770	635	450	510	635	2,050
2	.....	1,590	5,500	1,950	1,500	1,160	770	635	450	1,080	635	1,860
3	.....	1,500	4,890	1,950	1,770	1,000	770	635	450	1,160	700	1,770
4	.....	1,410	4,320	1,860	2,150	1,000	770	635	450	1,160	700	1,680
5	.....	1,240	3,150	1,680	2,250	1,000	770	570	450	920	700	1,680
6	.....	1,240	2,950	1,680	1,950	920	840	570	510	770	1,160	1,860
7	.....	1,240	2,950	1,770	1,860	840	770	570	510	700	1,680	1,680
8	.....	1,080	2,850	2,050	1,770	920	770	570	510	635	2,050	1,860
9	.....	1,080	2,550	1,950	1,860	920	770	570	510	635	3,050	2,050
10	.....	1,080	2,350	1,770	2,150	1,000	840	635	510	570	3,670	2,050
11	.....	1,000	2,250	1,860	2,050	1,080	840	635	510	570	3,050	1,860
12	.....	1,000	2,250	1,770	1,860	1,160	840	635	510	570	2,650	1,680
13	.....	1,590	2,150	1,770	1,860	1,080	770	635	450	570	2,450	1,500
14	.....	1,240	2,150	1,590	1,770	1,000	770	635	450	570	2,450	1,320
15	.....	1,160	2,550	1,500	1,590	1,000	770	635	510	570	2,450	1,240
16	1,080	1,080	2,550	1,500	1,500	840	770	635	510	510	2,350	1,160
17	2,050	1,160	2,750	1,680	1,500	840	770	635	570	510	2,250	1,000
18	1,240	1,080	2,550	1,680	1,500	840	700	635	570	510	2,050	1,080
19	1,160	1,080	2,550	1,770	1,320	920	700	635	570	510	2,050	1,160
20	1,000	1,160	2,550	1,860	1,320	840	700	635	510	510	1,950	1,160
21	1,000	1,080	2,550	1,860	1,410	840	700	635	510	510	1,680	1,080
22	1,950	1,080	2,250	1,860	1,410	840	700	635	510	510	1,590	1,080
23	3,150	1,000	2,250	2,050	1,320	770	635	635	510	570	1,500	1,000
24	3,050	1,080	2,150	2,150	1,410	770	635	635	510	570	1,320	1,000
25	2,250	1,240	1,950	2,250	1,240	770	635	635	510	570	1,320	1,000
26	1,950	1,770	2,050	2,350	1,240	840	635	635	510	570	1,320	1,000
27	1,770	2,650	1,770	2,250	1,240	770	635	635	510	570	1,410	1,080
28	1,770	3,150	1,770	2,050	1,240	770	635	570	510	570	1,410	1,080
29	1,680	.....	1,680	1,860	1,160	770	635	570	510	570	1,500	1,000
30	1,680	.....	1,680	1,500	1,240	840	635	510	510	570	1,860	1,000
31	2,050	.....	1,770	.....	1,240	.....	635	510	.....	635	.....	1,000

NOTE.—Daily discharge determined from a rating curve well defined between 450 and 1,200 second-feet.

Monthly discharge of Hood River at Winans, Oreg., for 1910.

[Drainage area, 282 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January 16-31	3,150	1,000	1,800	6.38	3.80	57,300	B.
February	3,150	1,000	1,350	4.79	4.99	75,000	B.
March	5,500	1,680	2,680	9.50	10.95	165,000	C.
April	2,350	1,500	3,190	11.3	12.61	190,000	C.
May	2,250	1,160	1,580	5.60	6.46	97,200	B.
June	1,160	770	914	3.24	3.62	54,400	B.
July	840	635	729	2.58	2.97	44,800	B.
August	635	510	612	2.17	2.50	37,600	B.
September	570	450	502	1.78	1.99	29,900	B.
October	1,160	510	637	2.26	2.61	39,200	B.
November	3,670	635	1,790	6.35	7.08	107,000	B.
December	2,050	1,000	1,390	4.93	5.68	85,500	B.
The period	.....	.....	.....	.....	.....	983,000	

WHITE SALMON RIVER BASIN.

GENERAL FEATURES.[1]

White Salmon River heads in White Salmon River, Pinnacle, and South Avalanche glaciers, on the west side of Mount Adams, flows southward, and unites with Columbia River at the town of Underwood. The length of the river is 38.5 miles, and its drainage area comprises 352 square miles.

Trout Creek, its principal tributary, drains the high spurs and secondary peaks southwest of Mount Adams, flows southeastward, and unites with White Salmon River near Trout Lake post office. Three small creeks—Big Spring Creek from the west and Gilmer and Rattlesnake creeks from the east—join the river below Trout Creek, in the vicinity of Husum. Gotchen Creek, the chief tributary above Trout Creek, drains the high spurs southeast of Mount Adams. All the streams of the area flow in deep canyons on beds of bowlders, with here and there ledges of basalt or stretches of box canyons with vertical, jagged sides and solid beds.

The rolling benches along the lower part of the river have been cleared for agriculture. In T. 6 N. irrigation is practiced extensively. The water for the small but numerous ditches is diverted from Trout Creek and White Salmon River, and the supply is abundant. At present lumbering is the principal industry of the area. The Wind River Lumber Co. has constructed several splash dams on White Salmon River, by means of which logs are floated from the upper portion of the basin to the mouth of the river, where they are gathered and transported in rafts to the mills on the lower Columbia.

So far as known the basin affords no large reservoir sites. The porous lava rocks and the resulting soil which characterize the area hold a large amount of water in ground storage. Springs are numerous along the river, and seepage into it is large.

The lowest discharge of White Salmon River above Trout Creek is during cold weather; that of Trout Creek is at the end of the summer season; the two streams therefore maintain a well-balanced flow during the year. The heaviest floods are likely to occur in the autumn after an early snowfall, which is followed by heavy rains accompanying Chinook winds. The spring floods that occur periodically are rarely so severe or so sudden as the fall floods.

No discharge data were gathered in this basin prior to the water-power survey, made by the United States Geological Survey in the summer of 1909.[2] Stations established at that time on White Salmon River and Trout Creek have been continued during 1910.

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[1] For more detailed description of the general features of the basin, see Water-Supply Paper U. S. Geol. Survey No. 272, 1911, pp. 420–424.

[2] For results of this investigation, see Stevens, J. C., Water powers of the Cascade Range, Part I, Southern Washington: Water-Supply Paper U. S. Geol. Survey No. 253, 1910.

Opportunities for water-power development in the basin are abundant, as grades are steep, the summer flow is well maintained, and the rocky canyons through which the river flows afford many favorable sites. The average fall of the main river for that part surveyed—32.1 miles—is 83 feet to the mile.

WHITE SALMON RIVER AT HUSUM, WASH.

This station, which is located 1,200 feet above the falls, 1,600 feet above the highwa bridge at Husum, Wash., and is 7½ miles above the mouth of the river, was established September 23, 1909.

Discharge measurements are made from the bank by means of a meter suspended on a light cable. No equipment has been installed for making measurements at high stages. Just below the station is a flume, which diverts water for the Husum power plant.

The gage is a vertical staff in two sections.

No measurements were made during 1910, and no rating curve has yet been developed.

Daily gage height, in feet, of White Salmon River at Husum, Wash., for 1910.

[H. M. Thompson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.65	4.2	5.35	4.35	4.9	4.3	3.8	3.35	3.1	3.0	2.95	3.65
2	3.55	4.05	6.25	4.35	4.8	4.25	3.8	3.35	3.1	3.05	2.9	3.75
3	3.5	4.0	6.55	4.4	4.8	4.25	3.8	3.35	3.1	3.7	3.0	4.4
4	3.55	3.9	6.15	4.4	4.8	4.2	3.8	3.3	3.1	3.6	2.95	4.3
5	3.55	3.85	5.95	4.35	4.8	4.2	3.8	3.3	3.1	3.5	2.95	4.35
6	3.55	3.85	5.45	4.3	4.8	4.15	3.75	3.3	3.1	3.2	2.95	4.2
7	3.6	3.80	5.15	4.3	4.8	4.1	3.75	3.3	3.1	3.15	3.3	4.1
8	3.55	3.75	4.95	4.45	4.8	4.1	3.7	3.25	3.1	3.1	3.5	4.2
9	3.55	3.7	4.75	4.45	4.8	4.05	3.7	3.25	3.1	3.1	3.45	4.1
10	3.5	3.6	4.65	4.5	4.85	4.1	3.7	3.3	3.1	3.05	4.6	4.1
11	3.5	3.6	4.60	4.55	4.95	4.1	3.7	3.25	3.1	3.05	5.0	4.05
12	3.45	3.55	4.60	4.75	5.00	4.1	3.75	3.25	3.1	3.05	4.2	4.0
13	3.45	3.7	4.75	4.85	5.00	4.05	3.7	3.25	3.1	3.05	3.9	3.9
14	3.45	3.75	4.85	4.75	4.95	4.05	3.65	3.25	3.1	3.0	3.9	3.85
15	3.45	3.65	4.9	4.7	4.9	4.05	3.65	3.2	3.05	3.0	3.8	3.8
16	3.4	3.6	4.95	4.7	4.8	4.0	3.65	3.2	3.05	3.0	3.5	3.75
17	3.4	3.55	5.1	4.7	4.75	4.0	3.6	3.2	3.05	3.0	3.4	3.7
18	3.5	3.55	5.15	4.75	4.7	4.0	3.6	3.2	3.05	3.0	3.35	3.7
19	3.55	3.5	5.35	4.75	4.7	4.0	3.55	3.2	3.05	3.05	3.4	3.65
20	3.5	3.5	5.55	4.8	4.6	4.0	3.5	3.15	3.05	3.05	4.2	3.6
21	3.5	3.5	5.65	5.0	4.6	4.0	3.5	3.15	3.1	3.0	5.45	3.55
22	3.65	3.45	5.5	4.9	4.5	3.95	3.5	3.15	3.1	3.0	5.95	3.6
23	4.4	3.45	5.35	4.95	4.5	3.9	3.45	3.2	3.1	3.0	4.95	3.7
24	4.25	3.45	5.15	4.95	4.5	3.9	3.45	3.15	3.1	2.95	4.5	3.75
25	4.05	3.7	4.95	4.95	4.5	3.9	3.45	3.15	3.05	3.0	4.2	3.8
26	4.55	3.75	4.8	5.1	4.45	3.9	3.4	3.15	3.05	3.0	3.85	3.75
27	4.35	4.15	4.65	5.1	4.45	3.85	3.4	3.2	3.05	3.0	3.85	3.7
28	4.25	4.55	4.5	5.1	4.45	3.85	3.4	3.2	3.0	2.95	3.8	3.65
29	4.10	.....	4.45	5.0	4.4	3.85	3.35	3.15	3.0	2.95	3.6	3.65
30	4.05	.....	4.4	4.95	4.4	3.85	3.35	3.15	3.0	2.95	3.55	3.7
31	4.35	.....	4.4	.....	4.35	.....	3.4	3.15	.....	2.95	.....	3.6

NOTE.—Gage heights refer to a new datum 0.16 foot lower than that used in 1909.

TROUT CREEK AT GULER, WASH.

This station, which is located at Guler post office, Wash., 2 miles above the mouth of the creek, one-fourth mile below Trout Lake, and above all diversions for irrigation, was established September 16, 1909.

The gage is on the left bank, 500 feet below the highway bridge, on the meridian line between secs. 22 and 23, T. 16 N., R. 10 E. The lower section is inclined and reads to 3 feet. The upper section is vertical and reads from 3 feet to 11.5 feet.

Discharge measurements are made from the highway bridge or, at low stages, by wading.

No measurements were made during 1910 and no rating curve has yet been developed.

Daily gage height, in feet, of Trout Creek at Guler, Wash., for 1910.

[Christian Guler, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.50	4.67	4.05	4.40	4.40	3.60	2.00	1.42	1.34	1.34	1.50	3.84
2	2.70	4.80	4.55	4.30	4.40	3.69	2.00	1.41	1.33	1.36	1.72	3.84
3	3.00	4.15	4.80	4.30	4.30	3.69	2.00	1.42	1.33	1.40	1.81	3.84
4	3.00	3.92	5.70	4.30	4.50	3.68	1.99	1.42	1.33	1.80	1.90	3.83
5	2.90	3.10	5.75	4.20	4.40	3.50	1.98	1.40	1.33	1.82	2.20	3.83
6	2.80	2.50	5.30	4.20	4.40	3.50	1.98	1.40	1.33	1.80	2.42	3.80
7	2.80	2.50	5.00	4.30	4.40	3.50	1.95	1.40	1.32	1.74	2.80	3.80
8	3.00	2.50	4.70	4.30	4.40	3.40	1.92	1.39	1.32	1.74	3.22	3.76
9	3.00	2.50	4.55	4.20	4.40	3.40	1.92	1.39	1.32	1.74	3.44	3.76
10	3.10	2.29	4.31	4.30	4.40	3.30	1.90	1.39	1.31	1.73	3.77	3.74
11	3.20	2.28	3.90	4.32	4.30	3.20	1.90	1.40	1.30	1.70	3.72	3.73
12	3.50	2.30	3.64	4.40	4.30	3.10	1.87	1.41	1.30	1.70	3.60	3.73
13	3.50	2.50	3.64	4.40	4.30	2.90	1.81	1.40	1.30	1.70	3.56	3.73
14	3.60	2.50	3.72	4.45	4.20	2.75	1.80	1.39	1.30	1.70	3.35	3.70
15	3.60	2.40	4.00	4.45	4.20	2.65	1.75	1.39	1.30	1.70	3.00	3.70
16	3.70	2.40	4.10	4.45	4.20	2.60	1.70	1.40	1.30	1.70	3.00	3.70
17	3.81	2.40	4.20	4.50	4.00	2.55	1.69	1.40	1.30	1.68	3.05	3.70
18	3.90	2.40	4.30	4.50	4.00	2.50	1.68	1.40	1.30	1.65	3.54	3.70
19	4.23	2.40	4.30	4.50	4.00	2.45	1.62	1.40	1.30	1.60	4.26	3.72
20	4.30	2.40	4.42	4.50	4.10	2.40	1.61	1.39	1.30	1.56	4.91	3.72
21	4.40	2.50	4.40	4.60	3.80	2.30	1.60	1.38	1.32	1.58	6.02	3.72
22	4.50	2.50	4.40	4.60	4.00	2.30	1.60	1.39	1.34	1.51	5.43	3.72
23	4.50	2.50	4.38	4.70	3.90	2.25	1.60	1.37	1.34	1.50	5.15	3.80
24	4.40	2.40	4.50	4.70	3.80	2.25	1.59	1.37	1.33	1.50	4.92	3.88
25	4.40	2.60	4.50	4.80	3.80	2.20	1.58	1.35	1.33	1.50	4.35	3.9
26	4.20	2.70	4.50	4.80	3.80	2.10	1.56	1.35	1.33	1.50	4.00	3.87
27	4.00	2.70	4.50	4.70	3.70	2.10	1.55	1.34	1.33	1.50	3.96	3.62
28	4.00	2.75	4.40	4.60	3.70	2.00	1.49	1.34	1.33	1.51	3.94	3.60
29	4.00	.....	4.40	4.50	3.70	2.00	1.46	1.33	1.32	1.51	3.89	3.70
30	3.85	.....	.....	4.50	3.70	2.00	1.46	1.35	1.32	1.50	3.85	3.50
31	3.45	.....	.....	.....	3.60	.....	1.43	1.35	.....	1.50	.....	3.63

NOTE.—Stream frozen Jan. 3 to 16.

SANDY RIVER BASIN.

GENERAL FEATURES.

Sandy River heads in the glaciers of Mount Hood, flows northwestward, and unites with Columbia River at Troutdale. It drains the eastern slope of the Cascade Mountains at the very northern extremity in Oregon. The principal tributaries are Bull Run River, which drains the Bull Run National Forest and furnishes the water supply for the city of Portland; Salmon River, the Little Sandy, and Zigzag, Camp, and Still creeks. The elevation at Bull Run post office is 647 feet above sea level; at Salmon post office, 1,000 feet; at Bull Run Lake, 3,161 feet; and at Government Camp, 3,880 feet. The summit of Zigzag Mountain is 5,014 feet in altitude and that of Mount Hood 11,225 feet. The drainage area includes 521 square miles at the mouth of the river, 228 square miles above the mouth of Bull Run, and 118 square miles above the mouth of Zigzag Creek. The drainage area of Bull Run River at the mouth is 168 square miles.

The mean annual precipitation at Bull Run is 76 inches; at Government Camp, 87 inches. It is likely, however, that the figure for Government Camp is not representative, because of the close proximity of the station to Mount Hood. A large part of the precipitation on the headwaters falls as snow. In the foothills, however, it nearly all appears as rain during the nine months from September to May. The value of the waters of this stream lie in their availability for municipal water supplies and in the water power that can be generated by them. Favorable sites for power development are numerous and the distance to an industrial center is not great. A large part of the drainage area is heavily forested, although there are many areas from which the timber was burned a good many years ago. These areas have, however, grown up in second-growth timber and the underbrush is almost impenetrable.

As is usual with glacial streams, a protracted period of cold weather is very likely to cause lower water for a short period in winter than the natural low-water flow in the summer time.

The best storage site in the basin is probably at Summit Swamp, on Salmon River, in secs. 6, 7, and 18, T. 4 S., R. 9 E., where about 60,000 acre-feet of water can be impounded with a 150-foot dam. At Bull Run Lake the water leaks through a natural dam of glacial bowlders. The natural storage thus provided probably could not be augmented artificially except at a prohibitive cost.

SANDY RIVER ABOVE SALMON RIVER, AT BRIGHTWOOD, OREG.

This station, which was located in sec. 24, T. 2 S., R. 6 E., at McIntyre's bridge just back of the post office at Brightwood, Oreg., and one-half mile above the mouth of Salmon River, was established May 17, 1910, in cooperation with the Mount Hood Railway & Power Co.

There are no important diversions above the station.

Discharge measurements are made from the bridge.

Discharge measurements of Sandy River above Salmon River, at Brightwood, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 17	John Dubuis	53	249	2.32	667
June 18	J. C. Stevens	51	220	1.78	366
July 20	F. C. Ebert	52	207	1.73	365
Aug. 18	F. F. Henshaw	50	187	1.50	306
19	do	50	179	1.48	287

Daily gage height, in feet, of Sandy River above Salmon River, at Brightwood, Oreg., for 1910.

[Glenn McIntyre, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.10	1.70	1.51	1.28	1.60	1.42	2.58
2	.....	2.00	1.70	1.48	1.24	1.58	1.45	2.92
3	.....	1.92	1.66	1.48	1.30	2.68	1.60	3.10
4	.....	1.90	1.65	1.50	1.28	2.22	1.52	3.08
5	.....	1.90	1.68	1.48	1.30	2.25	1.48	2.88
6	.....	1.85	1.72	1.48	1.30	2.00	1.65	2.71
7	.....	1.90	1.70	1.51	1.22	1.90	2.62	2.70
8	.....	1.85	1.74	1.50	1.20	1.75	2.80	2.82
9	.....	1.85	1.80	1.58	1.20	1.75	3.25	2.80
10	.....	1.90	1.78	1.48	1.22	1.72	3.40	2.62
11	.....	2.38	1.80	1.48	1.21	1.70	3.18	2.48
12	.....	2.10	1.78	1.48	1.18	1.68	2.80	2.36
13	.....	1.92	1.72	1.45	1.20	1.58	2.55	2.22
14	.....	1.90	1.75	1.40	1.20	1.50	2.35	2.12
15	.....	1.90	1.72	1.38	1.20	1.50	2.20	2.02
16	.....	1.90	1.74	1.34	1.26	1.50	2.08	1.96
17	2.32	1.82	1.68	1.36	1.24	2.05	1.98	1.91
18	2.30	1.78	1.62	1.40	1.20	2.00	2.00	1.86
19	2.28	2.05	1.64	1.48	1.32	1.78	2.05	1.79
20	2.20	1.90	1.72	1.44	1.42	1.72	3.22	1.75
21	2.19	1.86	1.78	1.38	1.55	1.66	3.90	1.75
22	2.20	1.80	1.65	1.36	1.38	1.60	3.55	1.75
23	2.20	1.76	1.59	1.36	1.28	1.60	3.88	2.25
24	2.25	1.72	1.59	1.29	1.30	1.72	3.30	2.72
25	2.22	1.74	1.59	1.30	1.21	1.72	2.86	2.65
26	2.15	1.75	1.55	1.35	1.20	1.62	2.55	2.28
27	2.15	1.76	1.55	1.32	1.22	1.52	2.42	2.20
28	2.08	1.74	1.54	1.40	1.25	1.50	2.40	2.18
29	2.10	1.72	1.52	1.31	1.25	1.46	2.58	2.10
30	2.10	1.74	1.52	1.28	1.28	1.45	2.72	2.14
31	2.10	.....	1.50	1.32	.....	1.41	.....	2.05

Daily discharge, in second-feet, of Sandy River above Salmon River, at Brightwood, Oreg., for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	506	349	298	249	321	277	979
2	.....	456	349	290	242	316	284	1,280
3	.....	422	338	290	252	908	321	1,460
4	.....	414	335	295	249	572	300	1,440
5	.....	414	343	290	252	590	290	1,250
6	.....	396	355	290	252	456	335	1,090
7	.....	414	349	298	238	414	857	1,080
8	.....	396	361	295	235	364	1,020	1,190
9	.....	396	379	316	235	364	1,470	1,170
10	.....	414	373	290	238	355	1,640	1,010
11	.....	672	379	290	237	349	1,390	899
12	.....	506	373	290	232	343	1,020	807
13	.....	422	355	284	235	316	800	703
14	.....	414	364	272	235	295	652	635
15	.....	414	355	268	235	295	560	574
16	.....	414	361	260	245	295	496	541
17	633	386	343	264	242	481	448	514
18	620	373	327	272	235	456	456	490
19	608	481	332	290	256	373	481	458
20	560	414	355	281	277	355	1,440	441
21	555	400	373	268	308	338	2,260	441
22	560	379	335	264	268	321	1,960	441
23	560	367	318	264	249	321	2,360	725
24	590	355	318	250	252	355	1,680	1,100
25	572	361	318	252	237	355	1,230	1,040
26	533	364	308	262	235	327	955	747
27	533	367	308	256	238	300	853	689
28	496	361	305	272	244	295	837	676
29	506	355	300	254	244	286	979	622
30	506	361	300	249	249	284	1,100	649
31	506	.....	295	256	.....	274	.....	592

NOTE.—Daily discharge determined from rating curves fairly well defined.

Monthly discharge of Sandy River above Salmon River, at Brightwood, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 17-31	633	496	556	16,500	B.
June	672	355	413	24,600	B.
July	379	295	340	20,900	A.
August	316	249	276	17,000	A.
September	308	232	246	14,600	A.
October	908	274	377	23,200	B.
November	2,360	277	958	57,000	B.
December	1,460	441	830	51,000	B.
The period	.....	.....	.....	225,000	

SANDY RIVER BELOW SALMON RIVER, NEAR BRIGHTWOOD, OREG.[1]

This station, which is located at a highway bridge 1 mile below Salmon post office, Oregon, and 1 mile below the mouth of Salmon River, was established December 12, 1907.

The chain gage is attached to the upstream side of the highway bridge.

Discharge measurements are made from the bridge.

[1] Station formerly described as "at Salmon."

Conditions at the station are favorable for individual measurements of considerable accuracy during medium and low stages. During the summer months glacial silt is deposited which may affect the stability of the rating curve for low stages. No high-water measurements have yet been made and computations of discharge are withheld for further data, except for the low-water period, July to September, for which the records are good.

Discharge measurements of Sandy River below Salmon River, near Brightwood, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec-ft.*
June 18	J. C. Stevens	89	355	3.65	600
18	John Dubuis	89	355	3.63	592
July 20	F. C. Ebert	88	329	3.4	467
Aug. 19	F. F. Henshaw	84	302	3.18	351
Sept. 8	Ebert and Bolster	80	271	2.97	280

Daily gage height, in feet, of Sandy River below Salmon River, near Brightwood, Oreg., for 1910.

[J. B. McIntyre, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.05	4.85	11.3	5.15	4.75	4.15	3.55	3.25	3.1	3.25	4.5	5.35
2	4.1	4.50	9.98	5.25	4.7	4.1	3.5	3.25	3.1	3.15	4.55	5.70
3	4.05	4.05	9.1	5.3	5.7	4.1	3.5	3.25	3.2	4.1	4.65	6.0
4	4.0	3.9	8.75	5.45	5.55	4.05	3.5	3.25	3.15	4.65	4.65	6.05
5	4.0	3.85	8.55	5.5	5.4	4.0	3.45	3.25	3.1	4.75	4.6	5.9
6	3.95	3.85	7.2	5.65	5.15	3.95	3.5	3.25	3.1	4.3	4.7	5.8
7	3.9	3.95	6.05	5.4	4.95	3.85	3.5	3.25	3.05	4.15	5.3	5.85
8	3.85	4.05	5.95	5.35	4.95	3.8	3.55	3.25	3.1	4.05	6.3	5.85
9	3.8	4.15	6.0	5.5	4.9	3.75	3.6	3.3	3.1	4.05	6.3	5.7
10	3.75	4.15	6.0	5.7	5.4	3.8	3.55	3.25	3.1	3.95	6.45	5.55
11	3.75	4.2	6.15	5.75	5.35	4.45	3.55	3.25	3.05	3.8	6.3	5.5
12	3.7	4.25	6.6	5.8	5.1	4.3	3.5	3.25	3.05	3.8	5.95	5.35
13	3.65	5.4	6.75	5.75	4.95	4.05	3.5	3.25	3.05	3.8	5.75	5.2
14	3.65	4.65	6.85	5.65	4.9	3.9	3.5	3.2	3.05	3.8	4.95	4.95
15	3.65	4.25	6.75	5.4	4.75	3.85	3.5	3.15	3.1	3.85	4.4	4.75
16	3.6	4.15	6.65	5.3	4.65	3.8	3.45	3.15	3.15	3.85	4.3	4.4
17	3.6	4.3	6.5	5.25	4.6	3.75	3.45	3.2	3.05	4.55	4.35	4.3
18	3.85	4.55	6.2	5.4	4.5	3.75	3.45	3.2	3.05	4.65	4.35	4.25
19	4.65	4.55	5.95	5.55	4.4	3.95	.....	3.25	3.05	4.55	4.95	4.2
20	4.9	4.5	6.05	5.6	4.35	3.85	.....	3.2	3.10	4.5	6.05	4.2
21	5.35	4.65	6.2	5.6	4.35	3.8	3.4	3.15	3.20	4.5	7.6	4.55
22	6.2	4.8	6.25	5.75	4.3	3.75	3.4	3.25	3.15	4.55	6.45	4.8
23	7.25	5.1	6.2	5.85	4.35	3.7	3.4	3.2	3.10	4.65	6.9	4.95
24	7.0	5.75	5.95	5.75	4.4	3.7	3.35	3.2	3.05	4.6	6.3	5.15
25	6.1	6.05	5.8	5.7	4.35	3.65	3.35	3.15	3.05	4.6	5.7	5.1
26	5.7	5.85	5.35	5.6	4.25	3.65	3.35	3.15	3.0	4.55	5.4	4.95
27	5.45	5.95	5.15	5.35	4.2	3.6	3.3	3.2	3.0	4.55	5.15	4.85
28	5.2	7.55	5.05	5.1	4.15	3.6	3.3	3.25	3.05	4.55	5.1	4.7
29	5.05	.....	4.9	5.05	4.15	3.55	3.3	3.2	3.05	4.55	4.95	4.7
30	5.15	.....	4.8	4.95	4.2	3.55	3.3	3.15	3.1	4.5	5.0	4.65
31	5.05	.....	4.65	.....	4.2	.....	3.25	3.1	.....	4.5	.....	4.5

Daily discharge, in second-feet, of Sandy River below Salmon River, near Brightwood, Oreg., for 1910.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1	540	385	320	11	540	385	302	21	460	340	360
2	510	385	320	12	510	385	302	22	460	385	340
3	510	385	360	13	510	385	302	23	460	360	320
4	510	385	340	14	510	360	302	24	435	360	302
5	485	385	320	15	510	340	320	25	435	340	302
6	510	385	320	16	485	340	340	26	435	340	285
7	510	385	302	17	485	360	302	27	410	360	285
8	540	385	320	18	485	360	302	28	410	385	302
9	570	410	320	19	476	385	302	29	410	360	302
10	540	385	320	20	468	360	320	30	410	340	320
								31	385	320	.....

NOTE.—Daily discharge for low water only; rating curve well defined. Computations for rest of year withheld because of possible changes in channel and uncertainty as to high-water rating curve.

Monthly discharge of Sandy River below Salmon River, near Brightwood, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
July	570	385	481	29,600	B.
August	410	320	369	22,700	B.
September	360	285	315	18,700	B.

SANDY RIVER ABOVE BULL RUN RIVER, NEAR BULL RUN, OREG.

This station, which is located in sec. 12, T. 2 S., R. 4 E., 100 feet above the proposed lower dam site of the Mount Hood Railway & Power Co., 2½ miles southwest of Bull Run, Oreg., about 1,500 feet below the mouth of Cedar Creek, and about 3 miles above the mouth of Bull Run River, was established May 8, 1910, in cooperation with the Mount Hood Railway & Power Co.

There are no diversions of any importance above the station.

Discharge measurements are made from a cable at the gage.

The relation between gage height and discharge is not affected by ice but is occasionally affected by backwater from log jams in the river below the station.

Discharge measurements of Sandy River above Bull Run River, near Bull Run, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 13	John Dubuis	116	494	2.90	1,680
31	.....do	108	416	2.20	949
June 28	.....do	100	398	1.70	568
Aug. 19	F. F. Henshaw	90	333	1.30	386

NOTE.—Measurements of May 13 and 31 made from raft, others from cable.

Daily gage height, in feet, of Sandy River above Bull Run River, near Bull Run, Oreg., for 1910.

[Henry Oak, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.12	1.66	1.36	1.25	1.80	1.38	3.25
2	.....	2.02	1.65	1.36	1.25	1.74	1.36	3.72
3	.....	1.98	.....	1.39	1.19	3.15	1.51	4.10
4	.....	1.98	.....	1.38	1.20	3.10	1.65	4.20
5	.....	2.05	1.61	1.38	1.22	2.51	1.51	3.90
6	.....	2.00	1.64	1.38	1.22	2.25	1.53	3.54
7	.....	1.92	1.68	1.38	1.15	1.95	2.10	3.50
8	3.15	1.88	1.66	1.38	1.12	1.80	4.21	3.40
9	3.10	1.88	1.68	1.41	1.14	1.75	3.55	3.84
10	3.40	1.88	1.68	1.41	1.15	1.75	4.85	3.50
11	3.25	2.55	1.66	1.38	1.12	1.69	4.60	3.20
12	3.02	2.28	1.64	1.35	1.10	1.59	3.75	3.00
13	2.90	2.05	1.58	1.35	1.11	1.52	3.28	2.80
14	2.85	2.00	1.58	1.30	1.11	1.44	2.81	2.72
15	2.70	2.05	1.58	1.27	1.12	1.42	2.56	2.62
16	2.60	2.10	1.61	1.26	1.14	1.44	2.39	2.50
17	2.55	2.15	1.58	1.28	1.24	1.60	2.25	2.45
18	2.48	2.22	1.52	1.30	1.21	2.21	2.39	2.35
19	2.42	2.50	1.52	1.35	1.20	1.91	2.50	2.25
20	2.38	2.52	1.56	1.35	1.25	1.79	2.78	2.22
21	2.32	2.70	1.60	1.32	1.45	1.65	5.60	2.25
22	2.30	2.65	1.54	1.28	1.39	1.60	4.85	2.15
23	2.35	2.48	1.46	1.25	1.26	1.57	5.85	2.68
24	2.38	2.12	1.48	1.23	1.24	1.52	4.40	3.40
25	2.32	1.80	1.46	1.18	1.19	1.81	3.80	3.32
26	2.25	1.78	1.42	1.27	1.14	1.62	3.30	2.98
27	2.30	1.78	1.42	1.25	1.14	1.52	3.10	2.99
28	2.18	1.72	1.42	1.27	1.13	1.48	3.10	2.80
29	2.20	1.70	1.41	1.28	1.10	1.45	3.20	2.74
30	2.15	1.74	1.39	1.27	1.20	1.42	3.72	2.82
31	2.12	.....	1.38	1.27	.....	1.40	.....	2.72

NOTE.—Log jam June 15 to 25.

Daily discharge, in second-feet, of Sandy River above Bull Run River, near Bull Run, Oreg., for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	896	566	412	365	385	421	2,120
2	.....	816	560	412	365	618	412	2,770
3	.....	786	552	426	342	1,980	485	3,340
4	.....	786	544	421	345	1,920	560	3,490
5	.....	840	536	421	353	1,250	485	3,040
6	.....	800	554	421	353	1,000	495	2,520
7	.....	744	578	421	328	765	880	2,460
8	1,980	716	566	421	317	660	3,500	2,320
9	1,920	716	578	435	324	625	4,030	2,950
10	2,320	716	578	435	328	625	4,510	2,460
11	2,120	1,290	566	421	317	584	4,110	2,050
12	1,820	1,030	554	408	310	525	2,820	1,800
13	1,680	840	520	408	314	490	2,150	1,560
14	1,620	800	520	385	314	450	1,570	1,470
15	1,450	787	520	373	317	440	1,300	1,360
16	1,340	774	536	369	324	450	1,130	1,240
17	1,290	761	520	377	361	530	1,000	1,190
18	1,220	749	490	385	349	969	1,130	1,100
19	1,160	736	490	408	345	737	1,240	1,000
20	1,120	723	510	408	365	653	1,540	978
21	1,070	710	530	394	455	560	5,720	1,000
22	1,050	698	500	377	426	530	4,510	920
23	1,100	685	460	365	369	515	6,140	1,430
24	1,120	672	470	357	361	490	3,790	2,320
25	1,070	659	460	338	342	667	2,890	2,210
26	1,000	646	440	373	324	542	2,180	1,780
27	1,050	646	440	365	324	490	1,920	1,790
28	944	604	440	373	320	470	1,920	1,560
29	960	590	435	377	310	455	2,050	1,490
30	920	618	421	373	345	440	2,770	1,580
31	896	.....	421	373	.....	430	.....	1,470

NOTE.—Daily discharge determined from a rating curve well defined between 380 and 4,000 second-feet. Discharge interpolated June 15 to 25.

Monthly discharge of Sandy River above Bull Run River, near Bull Run, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 7-31	2,320	896	1,340	66,400	A.
June	1,290	590	761	45,300	A.
July	578	421	511	31,400	A.
August	435	338	395	24,300	A.
September	455	310	344	20,500	A.
October	1,980	385	685	42,100	A.
November	6,140	412	2,260	134,000	A.
December	3,490	920	1,900	117,000	A.
The period				481,000	

SANDY RIVER BELOW BULL RUN RIVER, NEAR BULL RUN, OREG.

This station, which is located in sec. 30, T. 1 S., R. 5 E., 2,000 feet below the highway bridge known locally as Sandy Bridge, about 2 miles northwest of Bull Run, Oreg., and about 1,000 feet below the mouth of Bull Run River, was established April 27, 1910, in cooperation with the Mount Hood Railway & Power Co.

The only important diversion above the station is the pipe line which takes water from Bull Run River for the city of Portland.

The relation between gage height and discharge is not affected by ice, but is occasionally affected by backwater from log jams in the river below the station.

Discharge measurements of Sandy River below Bull Run River, near Bull Run, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 9	John Dubuis	197	1,260	3.00	2,860
31	do	189	1,040	1.80	1,210
June 17	Stevens and Dubuis	188	990	1.57	987
Aug. 20	F. F. Henshaw	173	891	.87	460

Daily gage height, in feet, of Sandy River below Bull Run River, near Bull Run, Oreg., for 1910.

[G. B. Cross, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.65	1.90	1.80	0.95	0.75	1.10	0.85	4.0
2	.....	2.45	1.80	1.30	.94	.75	1.82	.85	4.0
3	.....	3.45	1.70	1.30	.94	.75	3.85	.85	4.5
4	.....	4.05	1.60	1.30	.93	.72	3.80	.85	5.5
5	.....	.....	1.60	1.30	.92	71	2.15	.85	5.0
6	.....	.....	1.60	1.30	.91	.70	2.00	.85	5.0
7	.....	3.30	1.50	1.30	.90	.70	1.80	2.00	4.8
8	.....	3.15	1.50	1.30	.90	.70	1.70	4.35	4.5
9	.....	3.45	1.50	1.30	.90	.70	1.40	5.50	4.0
10	.....	3.60	1.50	1.25	.90	.70	1.40	5.50	3.5
11	.....	3.35	2.60	1.25	.90	.70	1.40	4.50	3.0
12	.....	3.95	2.70	1.25	.90	.70	1.40	4.10	2.8
13	.....	2.80	1.80	1.24	.90	.69	1.70	4.00	2.5
14	.....	2.70	1.70	1.24	.90	.69	1.50	3.50	2.5
15	.....	2.60	1.70	1.23	90	.68	1.20	2.50	2.5
16	.....	2.40	1.70	1.23	.90	.69	1.10	2.60	2.4
17	.....	2.30	1.70	1.23	.90	.80	3.00	2.60	2.3
18	.....	2.20	1.60	1.23	.90	.80	2.50	2.60	2.0
19	.....	2.25	1.70	1.23	.90	.79	2.40	2.60	2.0
20	.....	2.10	1.70	1.23	.89	80	1.90	3.75	2.0
21	.....	2.00	1.60	1.23	.89	.80	1.70	6.0	2.0
22	.....	2.00	1.60	1.23	.89	.75	1.60	6.0	3.0
23	.....	2.00	1.60	1.23	.89	.70	1.40	6.25	3.5
24	.....	2.00	1.50	1.23	.88	.70	1.50	5.75	3.5
25	.....	2.00	1.50	1.23	.84	.65	1.30	5.5	3.4
26	.....	2.00	1.50	1.22	.81	.65	1.20	3.0	3.4
27	2.90	2.00	1.60	1.21	.80	.65	1.00	3.0	3.2
28	2.75	1.80	1.70	1.00	.80	.65	.95	3 0	3.2
29	2.55	2.00	1.80	1.00	.80	.65	.95	4.0	3.0
30	2.70	2.00	1.80	.95	.78	.69	.94	4.5	2.5
31	.....	2.00	.....	.95	.75	.....	.92	.....	2.5

NOTE.—Gage heights affected by jam of ties on riffle below gage June 27 to July 2.

Daily discharge, in second-feet, of Sandy River below Bull Run River, near Bull Run, Oreg., for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2,300	1,330	1,220	510	405	600	455	4,880
2	.....	2,010	1,220	750	504	405	1,240	455	4,880
3	.....	3,690	1,120	750	504	405	4,540	455	6 120
4	.....	5,000	1,020	750	498	390	4,430	455	9,000
5	.....	4,500	1,020	750	492	385	1,620	455	7,500
6	.....	4,000	1,020	750	486	380	1,440	455	7,500
7	.....	3,400	920	750	480	380	1,220	1,440	6,940
8	.....	3,030	920	750	480	380	1,120	5,740	6,120
9	.....	3,690	920	750	480	380	830	9,000	4,880
10	.....	4,000	920	710	480	380	830	9,000	3,790
11	.....	3,500	2,220	710	480	380	830	6,120	2,860
12	.....	2,780	2,370	710	480	380	830	5,120	2,530
13	.....	2,530	1,220	702	480	376	1,120	4,880	2,080
14	.....	2,370	1,120	702	480	376	920	3,790	2,080
15	.....	2,220	1,120	694	480	372	670	2,080	2,080
16	.....	1,940	1,120	694	480	376	600	2,220	1,940
17	.....	1,810	1,120	694	480	430	2,860	2,220	1,810
18	.....	1,680	1,020	694	480	430	2,080	2,220	1,440
19	.....	1,740	1,120	694	480	425	1,940	2,220	1,440
20	.....	1,560	1,120	694	475	430	1,330	4,320	1,440
21	.....	1,440	1,020	694	475	430	1,120	10,600	1,440
22	.....	1,440	1,020	694	475	405	1,020	10,600	2,860
23	.....	1,440	1,020	694	475	380	830	11,400	3,790
24	.....	1,440	920	694	470	380	920	9,800	3,790
25	.....	1,440	920	694	450	360	750	9,000	3,590
26	.....	1,440	920	686	435	360	670	2,860	3,590
27	2,690	1,440	1,020	678	430	360	540	2,860	3,210
28	2,450	1,220	1,120	540	430	360	510	2,860	3,210
29	2,150	1,440	1,220	540	430	360	510	4,880	2,860
30	2,370	1,440	1,220	510	420	376	504	6,120	2,080
31	.....	1,440	.....	510	405	.....	492	.....	2,080

NOTE.—Daily discharge determined from a rating curve well defined between 450 and 5,500 second-feet.

Monthly discharge of Sandy River below Bull Run River, near Bull Run, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 27-30	2,690	2,150	2,420	1,920	B.
May	5,000	1,220	2,370	146,000	B.
June	2,370	920	1,150	68,400	B.
July	1,220	510	705	43,300	B.
August	510	405	471	29,000	B.
September	430	360	388	23,100	B.
October	4,540	492	1,260	77,500	B.
November	11,400	455	4,470	266,000	B.
December	9,000	1,440	3,670	226,000	B.
The period				881,000	

STILL CREEK NEAR GOVERNMENT CAMP, OREG.

This station which is located in sec. 24, T. 3 S., R. 8½ E., one-fourth mile above Summit House, 1½ miles southeast of Government Camp, and about 10 miles southeast of Rowe, Oreg., was established April 23, 1910, in cooperation with the Mount Hood Railway & Power Co.

No water is diverted above the station.

The water of Still Creek can be diverted at this point into a storage site known as Salmon Meadows.

Discharge measurements of Still Creek near Government Camp, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 23	John Dubuis	11.5	13.4	1.20	20.3
July 19	F. C. Ebert	10	13.4	1.07	12.8
19	B. F. Heintzleman	10	12.5	1.07	12.1
Aug. 17	F. F. Henshaw	10	12.4	0.93	12.7
17	do	11	8.4	0.94	12.1
Nov. 21	John Dubuis	13	13.1	1.25	20.1

Daily gage height, in feet, of Still Creek near Government Camp, Oreg., for 1910.

[M. E. Meserve, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1.20	1.11	1.05	0.93	0.92	1.04	16	.....	1.15	1.10	0.94	0.90	1.02	.....
2	.....	1.20	1.11	1.05	.93	.95	1.05	17	.....	1.15	1.10	.92	.91	1.10	.....
3	.....	1.19	1.11	1.05	.93	1.15	1.08	18	.....	1.15	1.10	.92	.90	1.07	.....
4	.....	1.19	1.11	1.05	.93	1.10	1.12	19	.....	1.25	1.10	.92	.90	1.05	.....
5	.....	1.19	1.11	1.04	.93	1.05	1.15	20	.....	1.20	1.09	.92	.92	1.04	.....
6	.....	1.18	1.11	1.03	.93	1.04	1.19	21	.....	1.20	1.09	.90	.94	1.03	.....
7	.....	1.16	1.11	1.02	.94	1.02	1.27	22	.....	1.18	1.09	.92	.92	1.03	.....
8	.....	1.15	1.11	1.00	.93	1.00	1.24	23	.....	1.15	1.08	.92	.91	1.03	.....
9	.....	1.15	1.11	.97	.93	.99	1.32	24	1.22	1.15	1.08	.92	.91	1.03	.....
10	.....	1.15	1.11	.96	.93	.99	.....	25	1.22	1.17	1.08	.92	.91	1.05	.....
11	.....	1.20	1.10	.95	.92	1.02	.....	26	1.20	1.15	1.08	.92	.91	1.05	.....
12	.....	1.18	1.10	.95	.92	1.02	.....	27	1.20	1.13	1.06	.92	.91	1.05	.....
13	.....	1.18	1.10	.95	.92	1.02	.....	28	1.20	1.12	1.05	.92	.91	1.05	.....
14	.....	1.18	1.10	.95	.92	1.02	.....	29	1.20	1.12	1.05	.94	.91	1.05	.....
15	.....	1.16	1.10	.95	.91	1.02	.....	30	1.20	1.12	1.05	.94	.91	1.04	.....
								31	1.20	.....	1.05	.93	.....	1.04	.....

Daily discharge, in second-feet, of Still Creek near Government Camp, Oreg., for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	20	14	12	13	12	15	16	.....	17	13	12	12	14	.....
2	.....	20	14	12	13	13	15	17	.....	17	13	12	12	16	.....
3	.....	19	14	12	13	18	16	18	.....	17	13	12	12	15	.....
4	.....	19	14	13	13	16	17	19	.....	19	13	12	12	15	.....
5	.....	19	14	13	13	15	18	20	.....	18	13	12	12	15	.....
6	.....	19	14	13	13	15	19	21	.....	18	13	12	13	15	.....
7	.....	18	14	13	13	14	21	22	.....	18	13	12	12	15	.....
8	.....	18	14	12	13	14	20	23	20	17	13	12	12	15	.....
9	.....	18	14	12	13	14	22	24	21	16	13	12	12	15	.....
10	.....	17	14	12	13	14	.....	25	21	17	13	12	12	15	.....
11	.....	19	14	12	12	14	.....	26	20	16	13	12	12	15	.....
12	.....	18	14	12	12	14	.....	27	20	16	13	12	12	15	.....
13	.....	18	14	12	12	14	.....	28	20	15	12	12	12	15	.....
14	.....	18	14	12	12	14	.....	29	20	15	12	13	12	15	.....
15	.....	17	13	12	12	14	.....	30	20	15	12	13	12	15	.....
								31	20	.....	12	13	.....	15	.....

NOTE.—Daily discharge May 23 to Aug. 16 computed by indirect method for shifting channels; discharge for remainder of period determined from a fairly well defined rating curve.

Monthly discharge of Still Creek near Government Camp, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 23–31	21	20	20.2	361	B.
June	20	15	17.6	1,050	B.
July	14	12	13.3	818	B.
August	13	12	12.2	750	B.
September	13	12	12.4	738	B.
October	18	12	14.7	904	B.
November 1–9	22	15	18.1	323	B.
The period	.....	.....	.....	4,940	

SALMON CREEK NEAR GOVERNMENT CAMP, OREG.

This station, which is located in sec. 6, T. 4 S., R. 9 E., 500 feet above the ford on Salmon Creek, about 5 miles southeast of Government Camp and about 14 miles by road southeast of Rowe, Oreg., was established May 24, 1910, in cooperation with the Mount Hood Railway & Power Co.

The records show the amount of water available from this creek for storage at the site known as Salmon Meadows. No water is diverted above the gage.

A vertical staff gage was used until November 21, 1910, when a Friez automatic gage was installed.

Discharge measurements are made by wading in the vicinity of the gage or from a foot log.

The relation between gage height and discharge may occasionally be slightly affected by backwater from slush ice, but interpolation for such periods gives good estimates.

Discharge measurements of Salmon River near Government Camp, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 23	John Dubuis	21	27.1	1.30	66.6
July 19	B. F. Heintzleman	20	15.8	.80	29.1
19	F. C. Ebert	20	15.8	.80	29.2
Aug. 17	F. F. Henshaw	20	13.2	.60	22.2
Nov. 21	John Dubuis	23	28.2	1.35	77.2

Daily gage height, in feet, of Salmon River at Government Camp, Oreg., for 1910.

[M. E. Meserve, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.12	0.90	0.70	0.63	0.63	0.45	1.13
2	.....	1.10	.85	.70	.63	.67	.47	1.21
3	.....	1.08	.85	.70	.63	.95	.52	1.27
4	.....	1.05	.85	.70	.62	.80	.57	1.33
5	.....	1.10	.85	.69	.62	.70	.58	1.38
6	.....	1.08	.85	.69	.62	.65	.60	1.41
7	.....	1.05	.85	.69	.63	.60	.69	1.44
8	.....	1.03	.85	.69	.62	.54	.65	1.46
9	.....	1.02	.85	.69	.62	.50	.76	1.46
10	.....	1.02	.85	.69	.62	.50	.....	1.46
11	.....	1.35	.83	.68	.62	.50	.....	1.44
12	.....	1.10	.83	.68	.61	.52	.....	1.36
13	.....	1.02	.82	.68	.61	.52	.....	1.28
14	.....	1.02	.82	.67	.61	.52	.....	1.18
15	.....	1.02	.82	.66	.60	.51	.....	1.13
16	.....	1.02	.82	.65	.60	.51	.....	1.08
17	.....	1.00	.81	.62	.61	.65	.....	1.02
18	.....	.95	.81	.64	.60	.56	.....	.99
19	.....	1.10	.80	.64	.60	.50	.....	.96
20	.....	1.05	.80	.64	.67	.49	.....	.93
21	.....	1.02	.80	.64	.69	.48	1.30	.88
22	.....	1.02	.78	.63	.66	.47	1.10	.92
23	.....	1.02	.78	.63	.62	.46	1.28	1.04
24	1.35	1.02	.76	.62	.60	.48	.96	.94
25	1.35	1.05	.74	.62	.59	.49	.94	.88
26	1.25	1.02	.70	.62	.59	.49	.95	.87
27	1.25	1.00	.70	.62	.59	.49	.99	.87
28	1.20	1.00	.70	.62	.59	.48	1.02	.86
29	1.20	.90	.70	.64	.58	.46	1.06	.84
30	1.15	.90	.70	.64	.58	.46	1.08	.88
31	1.13	.....	.70	.63	.....	.45	.....	.91

NOTE.—Gage heights after Nov. 23 taken from a Friez self-recording gage.

Daily discharge, in second-feet, of Salmon River near Government Camp, Oreg., for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	53	36	25	22	22	15	54
2	.....	51	33	25	22	24	16	61
3	.....	49	33	25	22	40	18	66
4	.....	47	33	25	22	30	20	72
5	.....	51	33	25	22	25	20	77
6	.....	49	33	25	22	23	21	80
7	.....	47	33	25	22	21	25	83
8	.....	45	33	25	22	19	23	85
9	.....	45	33	25	22	17	28	102
10	.....	45	33	25	22	17	36	102
11	.....	74	32	24	22	17	60	99
12	.....	51	32	24	21	18	60	91
13	.....	45	31	24	21	18	51	83
14	.....	45	31	24	21	18	40	73
15	.....	45	31	23	21	17	30	68
16	.....	45	31	23	21	17	28	63
17	.....	43	31	22	21	23	28	58
18	.....	40	31	23	21	19	30	55
19	.....	51	30	23	21	17	43	53
20	.....	47	30	23	24	17	60	50
21	.....	45	30	23	25	16	69	47
22	.....	45	29	22	23	16	51	50
23	.....	45	29	22	22	15	67	60
24	74	45	28	22	21	16	40	51
25	74	47	27	22	21	17	39	47
26	64	45	25	22	21	17	40	46
27	64	43	25	22	21	17	42	46
28	60	43	25	22	21	16	45	45
29	60	36	25	23	20	15	48	44
30	56	36	25	23	20	15	49	47
31	54	.....	25	22	.....	15	.....	49

NOTE.—Daily discharge determined from rating curves applicable as follows: May 24 to Dec. 8, well defined from 20 to 80 second-feet; Dec. 9 to 31, fairly well defined from 24 to 100 second-feet. Daily discharge Nov. 10 to 20 determined from hydrograph comparison with record of Sandy and Bull Run Rivers.

Monthly discharge of Salmon River near Government Camp, Oreg., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 24–31	74	54	63.2	1,000	A.
June	74	36	46.6	2,770	A.
July	36	25	30.2	1,860	A.
August	25	22	23.5	1,440	A.
September	25	20	21.6	1,290	A.
October	40	15	19.2	1,180	A.
November	69	15	38.1	2,270	B.
December	102	44	64.7	3,980	B.
The period	.....	.....	.....	15,800	

BULL RUN RIVER NEAR BULL RUN, OREG.

This station, which is located 1½ miles above the intake of the Portland water supply pipe line, was established August 20, 1907, by the water board of the city of Portland in cooperation with the United States Geological Survey.

The drainage area of this stream is very densely forested and the water is exceptionally clear and pure. The pipe line is 30 miles long.

Prior to July 28, 1909, the gage used was just above the intake, but as low-stage gage heights were affected by a temporary brush dam that was constructed for diverting water into the pipe line, a Friez self-recording gage was installed at the present site. The lower gage is, however, read regularly. The Friez gage seems liable to get out of order at high water, and the discharge during periods of extreme flood or at other times when the gage is not recording has been estimated from the readings on the lower gage.

The rating curve for the upper section has been extended to cover the higher readings on the Friez gage by means of a curve of relation determined by plotting miscellaneous readings. The records for 1910 are believed to be very accurate.

Discharge measurements of Bull Run River near Bull Run, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 3	Stevens and Ebert	116	166	3.03	174
Aug. 19	F. F. Henshaw	36	82.3	2.66	79.2

Daily gage height, in feet, of Bull Run River near Bull Run, Oreg., for 1910.

[Friez self-recording gage.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.77	4.84	.....	4.18	3.94	3.25	3.11	2.70	2.62	3.04	3.08	4.96
2	3.75	4.52	.....	5.05	3.95	3.22	3.04	2.72	2.61	3.15	3.12	5.80
3	3.69	4.28	.....	4.80	4.90	3.22	3.03	2.73	2.60	5.10	3.60	5.65
4	3.69	4.11	.....	4.65	5.30	3.20	3.01	2.73	2.60	5.10	3.45	5.63
5	3.69	4.00	6.45	4.61	5.15	3.17	3.00	2.74	2.61	4.55	3.32	5.23
6	3.69	3.89	5.67	4.62	4.78	3.14	3.00	2.75	2.62	4.04	3.50	4.99
7	3.57	3.80	5.25	4.85	4.66	3.12	3.00	2.75	2.64	3.85	5.35	5.27
8	3.45	3.70	5.09	5.75	4.52	3.10	2.99	2.74	2.66	3.62	4.75	5.75
9	3.45	3.72	5.06	5.37	4.42	3.08	2.98	2.73	2.68	3.50	6.01	5.20
10	3.44	3.70	5.00	5.06	4.81	3.08	2.97	2.72	2.70	3.36	7.10	4.90
11	3.43	3.76	5.12	4.95	4.75	4.05	2.96	2.71	2.70	3.29	6.17	4.60
12	3.40	3.88	5.32	4.82	4.47	3.70	2.94	2.70	2.70	3.29	5.29	4.30
13	3.33	4.15	5.64	4.76	4.30	3.45	2.92	2.68	2.70	3.20	4.78	4.14
14	3.30	3.63	5.60	4.51	4.20	3.36	2.90	2.68	2.70	3.13	4.40	4.98
15	3.28	3.32	5.58	4.38	4.04	3.32	2.90	2.68	2.70	3.10	4.15	4.88
16	3.28	3.11	5.45	4.32	3.93	3.30	2.88	2.67	2.70	3.08	3.96	4.82
17	3.28	.....	5.45	4.30	3.85	3.28	2.87	2.67	2.70	4.75	3.82	3.72
18	4.26	.....	.....	4.50	3.78	3.20	2.86	2.67	2.65	4.55	4.03	3.62
19	4.28	4.25	5.50	4.63	3.72	3.38	2.85	2.67	2.64	4.08	4.30	3.55
20	.....	4.20	5.07	4.85	3.65	3.45	2.84	2.66	2.64	3.80	.....	3.52
21	.....	4.15	4.95	4.72	3.60	3.45	2.82	2.66	2.67	3.62	.....	3.53
22	.....	3.93	5.20	4.61	3.56	3.40	2.81	2.66	2.66	3.50	.....	3.53
23	.....	4.37	5.15	4.70	3.54	3.33	2.80	2.65	2.65	3.42	.....	4.70
24	.....	4.83	4.80	4.71	3.52	3.28	2.79	2.65	2.65	3.48	.....	5.19
25	.....	5.87	4.57	4.62	3.50	3.23	2.77	2.65	2.65	3.60	.....	4.90
26	4.95	5.80	4.42	4.52	3.52	3.22	2.75	2.64	2.65	3.47	4.47	4.63
27	5.13	.....	4.27	4.25	3.54	3.18	2.73	2.64	2.65	3.35	4.37	4.57
28	5.58	.....	4.23	4.08	3.40	3.16	2.72	2.67	2.65	3.30	4.56	4.46
29	5.09	.....	4.11	3.96	3.50	3.13	2.71	2.68	2.64	3.25	5.13	4.46
30	4.95	.....	4.03	4.02	3.30	3.13	2.70	2.65	2.68	3.18	5.20	4.58
31	5.35	.....	4.08	.....	3.28	.....	2.70	2.63	.....	3.12	.....	4.34

Daily gage height, in feet, of Bull Run River near Bull Run, Oreg., for 1910—Contd.

Staff gage at head works, Portland water board, observer.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.50	3.00	8.20	2.10	1.80	1.00	0.75	0.66	0.35	0.25	0.75	2.90
2	1.38	2.60	8.00	3.16	1.70	.85	.70	.60	.30	.88	.80	3.80
3	1.35	2.35	6.40	2.95	3.12	.92	.68	.60	.30	3.66	1.55	4.00
4	1.32	2.10	5.20	2.70	3.80	.90	.68	.60	.28	3.18	1.30	3.90
5	1.22	1.95	4.86	2.60	3.40	.90	.65	.60	.25	2.70	1.10	3.50
6	1.22	1.80	3.92	2.68	2.90	.82	.63	.60	.33	2.00	1.20	3.00
7	1.30	1.70	3.45	3.10	2.70	.80	.60	.60	.30	1.85	4.22	3.60
8	1.28	1.60	3.30	4.10	2.50	.80	.60	.57	.27	1.50	4.10	4.60
9	1.24	1.58	3.30	3.65	2.38	.75	.56	.54	.20	1.30	4.72	3.60
10	1.18	1.53	3.10	3.20	2.80	.74	.63	.50	.22	1.20	5.28	3.00
11	1.14	1.63	3.30	3.10	2.70	1.92	.63	.50	.26	1.00	5.30	2.50
12	1.10	1.72	3.45	2.95	2.50	1.48	.63	.48	.25	1.20	4.30	2.20
13	1.05	3.88	3.80	2.90	2.38	1.35	.62	.48	.20	.90	2.90	2.00
14	1.05	2.92	3.80	2.60	2.15	1.10	.60	.48	.15	.80	2.45	1.90
15	1.00	2.44	3.60	2.40	2.00	1.00	.58	.48	.15	.70	2.05	1.80
16	.98	2.13	3.60	2.30	1.80	1.00	.56	.48	.31	.65	1.85	1.70
17	1.00	2.20	3.55	2.30	1.75	1.00	.55	.48	.50	3.46	1.70	1.60
18	2.05	2.54	3.55	2.55	1.65	.94	.60	.40	.38	2.70	1.90	1.50
19	2.30	2.34	3.80	2.70	1.55	1.10	.70	.38	.25	2.00	2.30	1.30
20	1.85	2.26	3.35	2.15	1.45	1.25	.68	.38	.22	1.70	5.32	1.30
21	2.35	2.16	3.05	2.85	1.40	1.28	.68	.35	.35	1.45	5.50	1.25
22	4.60	1.90	3.30	2.60	1.35	1.26	.66	.33	.30	1.30	4.70	1.20
23	5.75	2.40	3.35	2.80	1.30	1.10	.63	.32	.30	1.25	4.60	2.55
24	5.50	3.93	2.95	2.75	1.35	1.02	.60	.32	.28	1.35	3.50	3.50
25	5.00	4.38	2.70	2.68	1.30	.94	.62	.30	.26	1.50	2.90	3.10
26	3.40	3.85	2.46	2.55	1.35	.91	.65	.30	.24	1.25	2.60	2.70
27	3.00	5.17	2.30	2.25	1.30	.86	.62	.30	.18	1.10	2.40	2.60
28	3.90	5.60	2.22	2.00	1.20	.84	.70	.33	.12	1.00	2.50	2.50
29	3.20	.....	2.10	1.85	1.35	.81	.70	.60	.15	.95	3.10	2.50
30	3.10	.....	1.95	2.00	1.10	.82	.70	.58	.15	.85	3.40	2.50
31	3.50	.....	2.04	.....	1.50	.....	.68	.45	.....	.80	.....	2.40

Daily discharge, in second-feet, of Bull Run River near Bull Run, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	428	1,100	9,490	628	500	234	191	91	76	171	182	1,200
2	420	854	9,030	1,290	505	224	171	95	74	203	194	2,120
3	396	688	5,080	1,070	1,150	224	168	97	72	1,340	360	1,940
4	396	586	3,620	950	1,550	218	163	97	72	1,340	302	1,920
5	396	530	2,940	918	1,390	209	160	99	74	875	257	1,470
6	396	476	1,960	926	1,050	200	160	102	76	550	320	1,230
7	348	440	1,500	1,110	958	194	160	102	80	460	1,600	1,520
8	302	400	1,330	2,060	854	188	158	99	83	368	1,030	2,060
9	302	408	1,300	1,630	784	182	155	97	87	320	2,370	1,440
10	298	400	1,240	1,300	1,080	182	152	95	91	270	3,820	1,150
11	295	424	1,360	1,200	1,030	555	150	93	1	247	2,570	910
12	284	472	1,570	1,090	819	400	145	91	91	247	1,540	700
13	260	610	1,930	1,040	700	302	140	87	91	218	1,050	604
14	250	372	1,880	847	640	270	135	87	91	197	770	1,220
15	244	257	1,860	756	550	257	135	87	91	188	610	1,130
16	244	191	1,720	714	495	250	130	85	91	182	510	1,090
17	244	665	1,720	700	460	244	128	85	91	1,030	448	408
18	676	832	1,720	840	432	218	126	85	82	875	545	368
19	688	670	1,770	934	408	277	124	85	80	570	700	340
20	520	640	1,310	1,110	380	302	121	83	80	440	3,800	328
21	735	610	1,200	1,010	360	302	117	83	85	368	4,100	332
22	2,750	495	1,440	918	344	284	114	83	83	320	2,890	332
23	4,520	749	1,390	990	336	260	112	82	82	291	2,750	990
24	4,100	1,090	1,070	998	328	244	110	82	82	313	1,510	1,430
25	3,320	2,200	889	926	320	228	106	82	82	360	1,050	1,150
26	1,200	2,120	784	854	328	224	102	80	82	309	819	934
27	1,370	3,580	682	670	336	212	97	80	82	267	740	889
28	1,860	4,270	658	570	284	206	95	85	82	250	882	812
29	1,330	.....	586	510	320	197	93	87	80	234	1,370	812
30	1,200	.....	545	540	250	197	91	82	87	212	1,440	896
31	1,600	.....	570	.....	244	.....	91	82	.....	194	.....	728

NOTE.—Daily discharge computed from automatic gage readings when available and from a rating curve well defined between 70 and 2,500 second-feet. Discharge for other days determined from readings of the gage at the head works and a fairly well defined rating curve.

Monthly discharge of Bull Run River near Bull Run, Oreg., for 1910.

[Drainage area, 96 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	4,520	244	1,010	10.5	12.1	62,100	B.
February	4,270	191	933	9.72	10.1	51,800	B.
March	9,490	545	2,090	21.8	25.1	129,000	B.
April	2,060	510	970	10.1	11.3	57,700	A.
May	1,550	244	619	6.45	7.44	38,100	A.
June	555	182	249	2.60	2.90	14,800	A.
July	191	91	132	1.38	1.59	8,120	A.
August	102	80	88.7	.924	1.07	5,450	A.
September	91	72	83.0	.865	.97	4,940	A.
October	1,340	171	426	4.44	5.12	26,200	A.
November	4,100	182	1,350	14.1	15.7	80,300	B.
December	2,120	328	1,050	10.9	12.6	64,600	A.
The year	9,490	72	749	7.80	105.99	543,000	

WILLAMETTE RIVER BASIN.

GENERAL FEATURES.

Willamette River drains a trough-shaped area, extending north and south between the Coast and Cascade ranges in Oregon. The area is roughly rectangular, approximately 230 miles in length and about 85 miles in width. The Willamette proper is formed by the junction of three main tributaries which unite in the vicinity of Eugene; these are the Coast Fork, the Middle Fork, and the McKenzie. The river is navigable for ocean-going vessels from the mouth to Portland, and for ordinary river steamboats from Portland to Corvallis, except during a few months of each year. From Corvallis to Eugene the river is navigable for light-draft boats during medium stages of the river. The falls of Willamette River at Oregon City are passed by a series of five locks, which are at present in private ownership.

The other principal tributaries of Willamette River are Santiam, Mollala, and Clackamas rivers. From the Coast Range flow Long Tom, Marys, Luckiamute, Yamhill, and Tualatin rivers. The drainage areas of this river and its principal tributaries are given in the following table:

Drainage areas in Willamette River basin.

	Square miles.
Willamette at the mouth	11,150
Willamette at Oregon City	10,200
Willamette at Salem	7,520
Willamette at Albany	4,860
Coast Fork of the Willamette	705
Middle Fork of the Willamette	1,450
McKenzie River	1,040
Santiam River	1,890
Yamhill River	763
Clackamas River	927
Tualatin River	690

From the summit of the mountain ranges the slopes are steep, but they merge gradually into a wide alluvial valley or gently rolling agricultural lands.

The entire drainage area may still be considered densely forested. The portions of the basin that contribute most to the flow of the streams are almost entirely within the boundaries of the national forests, and privately owned timber lands extend from the boundaries of the national forests to the main stream in the valley, except where lands have been cleared.

Although precipitation records at the summit of the Coast Range are meager, it is likely that the total annual rainfall is as much as 150 inches. On the eastern slope of the Coast Range precipitation decreases very rapidly to about 40 inches, but gradually increases again until at the summit of the Cascade Range it is approximately 100 inches annually. From north to south the same general variation is observed, although the differences are not so striking. At the mouth of the river the precipitation is approximately 50 inches, gradually decreases to about 40 in the vicinity of Corvallis, but increases again to 55 or 60 inches at the summit of the Callapooya Mountains, which form the southern boundary of the drainage area. Except on the summit of the mountain ranges this precipitation appears almost entirely as rainfall, 95 per cent falling during nine months, from September to May. On the mountain ranges part of the precipitation is snowfall, and the country is subject during the spring and fall to warm chinook winds, accompanied by rather sudden melting of these snows, which frequently cause considerable damage from floods. During the growing season when the precipitation rarely exceeds 2 inches the country is practically an arid section. Although irrigation has not long been practiced in the valley, it is likely that before many years a large part of the agricultural bottom lands will be placed under irrigation. Small ditches and pumping plants have been constructed, and the returns from irrigated agricultural lands show an increase of from 50 to 500 per cent in production over the nonirrigated lands.

Lying almost wholly within a narrow strip adjacent to the main divide of the Cascades, where the soil and underlying rock is porous, similar to that in the basin of Deschutes River on the east side of the range, are a number of lakes and marshes which afford favorable sites for storage reservoirs. As a result the streams flowing through the lakes and marshes experience no pronounced floods and are characterized by a large low-water flow. The effect of reservoirs on the Willamette would not be so marked as on more flashy streams, but their operation would greatly enhance the value of the river for irrigation, power, and navigation.

The highest known flood in the Willamette Valley occurred December, 1861, when the discharge at Albany was 220,000 cubic feet per second. The highest gage reading at Portland since that date occurred in 1894, but was due to backwater from Columbia River. The years 1899 and 1907 were "wet years." The year 1905 was a comparatively dry year. The longest record of stream flow in this basin has been obtained by applying recent measurements made at Albany to records obtained by the United States Weather Bureau since 1895.

MIDDLE FORK OF WILLAMETTE RIVER AT JASPER, OREG.

This station, which is located at the ferry near Jasper post office, Oreg., 2 miles above Natron, and 3 miles below the mouth of Fall Creek, was established September 16, 1905.

The summer flow has apparently been augmented by the operation of a recently constructed storage reservoir at Waldo Lake on the North Fork of Middle Fork. No stored water was released in 1910.

The vertical staff gage is on the right bank about 30 feet above the cable. Its datum has not been changed since the station was established.

The cable from which measurements were made was washed out in the flood of November, 1909, and the measurements at low water in 1910 were made from a boat at different sections.

The stream is largely used for transporting logs during all seasons of the year, and records of flow are therefore somewhat unreliable during the low-water periods, as logs frequently ground on the bars below the station and cause backwater on the gage. Except for this the records are reliable.

Discharge measurements of Middle Fork of Willamette River at Jasper, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 5	Henshaw and Davenport	155	235	2.97	745
Oct. 7	B. F. Heintzelman	325	1,160	3.20	968

NOTE.—Measurements taken from boat at different sections.

Daily gage height, in feet, of Middle Fork of Willamette River at Jasper, Oreg., for 1910.

[Philip Sylvester, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.0	5.5	11.4	4.4	4.3	3.8	3.3	3.0	2.9	2.9	2.9	6.7
2	4.8	5.2	10.2	4.5	4.2	3.8	3.3	3.0	2.9	3.0	2.9	6.0
3	4.6	5.0	8.7	4.7	4.4	3.7	3.3	3.0	2.9	3.1	2.9	6.8
4	4.4	4.8	7.9	4.7	4.4	3.6	3.3	3.0	2.9	4.3	2.9	7.8
5	4.2	4.7	7.3	4.6	4.4	3.6	3.3	3.0	2.9	3.6	2.9	6.7
6	4.2	4.7	6.8	4.7	4.3	3.6	3.3	3.0	2.9	3.4	2.9	6.0
7	4.3	4.6	6.2	4.8	4.3	3.5	3.2	3.0	2.9	3.2	3.0	5.6
8	4.4	4.5	5.9	4.7	4.3	3.5	3.2	3.0	2.9	3.1	5.0	5.3
9	4.3	4.4	5.7	4.7	4.4	3.5	3.2	3.0	2.9	3.1	4.8	6.4
10	4.2	4.5	5.5	4.7	5.3	3.5	3.2	3.0	2.9	3.0	4.6	5.9
11	4.2	4.5	5.4	4.7	5.6	3.6	3.2	3.0	2.9	3.0	4.7	5.5
12	4.2	4.6	5.4	4.7	5.2	3.6	3.2	3.0	2.9	3.1	4.4	5.3
13	4.1	4.7	5.5	4.6	5.0	3.5	3.2	3.0	2.9	3.2	4.0	5.0
14	4.1	5.0	5.6	4.5	4.7	3.5	3.2	3.0	3.0	3.1	3.7	4.8
15	4.0	5.1	5.6	4.4	4.5	3.5	3.2	3.0	3.0	3.0	3.7	4.7
16	4.0	4.8	5.5	4.4	4.4	3.6	3.2	3.0	2.9	3.0	3.5	4.5
17	3.9	4.7	5.4	4.4	4.3	3.6	3.1	2.9	3.0	3.0	3.4	5.6
18	3.9	5.4	5.3	4.4	4.2	3.5	3.1	2.9	3.0	3.3	3.5	5.2
19	4.7	6.7	5.4	4.5	4.1	3.5	3.1	2.9	3.0	3.2	3.8	4.9
20	4.5	6.2	5.3	4.8	4.0	3.5	3.1	2.9	3.2	3.1	3.9	4.8
21	4.4	5.8	5.0	4.8	4.0	3.6	3.1	2.9	3.3	3.0	3.9	4.5
22	4.9	5.5	5.1	4.6	4.0	3.6	3.1	2.9	3.1	3.0	4.5	4.4
23	6.2	5.5	5.7	4.6	3.9	3.7	3.1	2.9	3.0	3.0	5.4	4.3
24	5.8	5.6	5.3	4.7	4.0	3.6	3.1	2.9	2.9	3.0	8.1	4.8
25	5.2	7.2	5.1	4.8	4.1	3.5	3.1	2.9	2.9	3.0	6.4	4.8
26	5.2	6.7	5.0	4.8	4.0	3.4	3.1	2.9	2.9	3.0	5.4	4.6
27	5.9	6.7	4.8	4.7	4.0	3.4	3.1	2.9	2.9	3.0	4.4	4.7
28	7.2	8.4	4.7	4.5	3.9	3.4	3.0	2.9	2.9	3.0	9.6	4.6
29	6.4	.....	4.6	4.3	3.9	3.4	3.0	2.9	2.9	2.9	11.3	4.5
30	6.0	.....	4.5	4.3	3.9	3.3	3.0	2.9	2.9	2.9	8.4	4.6
31	5.8	.....	4.4	.....	3.9	.....	3.0	2.9	.....	2.9	.....	4.8

Daily discharge, in second-feet, of Middle Fork of Willamette River at Jasper, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,400	5,900	52,300	2,940	2,730	1,790	1,090	760	670	670	670	10,900
2	3,880	4,950	38,200	3,160	2,530	1,790	1,090	760	670	760	670	7,800
3	3,390	4,400	23,500	3,630	2,940	1,630	1,090	760	670	860	670	11,400
4	2,940	3,880	17,600	3,630	2,940	1,480	1,090	760	670	2,730	670	17,000
5	2,530	3,630	14,000	3,390	2,940	1,480	1,090	760	670	1,480	670	10,900
6	2,530	3,630	11,400	3,630	2,730	1,480	1,090	760	670	1,210	670	7,800
7	2,730	3,390	8,640	3,880	2,730	1,340	970	760	670	970	760	6,250
8	2,940	3,160	7,390	3,630	2,730	1,340	970	760	670	860	4,400	5,250
9	2,730	2,940	6,610	3,630	2,940	1,340	970	760	670	860	3,880	9,520
10	2,530	3,160	5,900	3,630	5,250	1,340	970	760	670	760	3,390	7,390
11	2,530	3,160	5,570	3,630	6,250	1,480	970	760	670	760	3,630	5,900
12	2,530	3,390	5,570	3,630	4,950	1,480	970	760	670	860	2,940	5,250
13	2,330	3,630	5,900	3,390	4,400	1,340	970	760	670	970	2,140	4,400
14	2,330	4,400	6,250	3,160	3,630	1,340	970	760	760	860	1,630	3,880
15	2,140	4,670	6,250	2,940	3,160	1,340	970	760	760	760	1,630	3,630
16	2,140	3,880	5,900	2,940	2,940	1,480	970	760	670	760	1,340	3,160
17	1,960	3,630	5,570	2,940	2,730	1,480	860	670	760	760	1,210	6,250
18	1,960	5,570	5,250	2,940	2,530	1,340	860	670	760	1,090	1,340	4,950
19	3,630	10,900	5,570	3,160	2,330	1,340	860	670	760	970	1,790	4,140
20	3,160	8,640	5,250	3,880	2,140	1,340	860	670	970	860	1,960	3,880
21	2,940	6,990	4,400	3,880	2,140	1,480	860	670	1,090	760	1,960	3,160
22	4,140	5,900	4,670	3,390	2,140	1,480	860	670	860	760	3,160	2,940
23	8,640	5,900	6,610	3,390	1,960	1,630	860	670	760	760	5,570	2,730
24	6,990	6,250	5,250	3,630	2,140	1,480	860	670	670	760	18,900	3,880
25	4,950	13,400	4,670	3,880	2,330	1,340	860	670	670	760	9,520	3,880
26	4,950	10,900	4,400	3,880	2,140	1,210	860	670	670	760	5,570	3,390
27	7,390	10,900	3,880	3,630	2,140	1,210	860	670	670	760	2,940	3,630
28	13,400	21,100	3,630	3,160	1,960	1,210	760	670	670	760	31,900	3,390
29	9,520	.....	3,390	2,730	1,960	1,210	760	670	670	670	51,100	3,160
30	7,800	.....	3,160	2,730	1,960	1,090	760	670	670	670	21,100	3,390
31	6,990	.....	2,940	.....	1,960	.....	760	670	.....	670	.....	3,880

NOTE.—Daily discharge determined from a rating curve well defined from 700 to 10,000 second-feet, and fairly well defined above.

Monthly discharge of Middle Fork of Willamette River at Jasper, Oreg., for 1910.

[Drainage area, 1,450 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	13,400	1,960	4,290	2.96	3.41	264,000	B.
February	21,100	2,940	6,150	4.24	4.42	342,000	B.
March	52,300	2,940	9,340	6.44	7.42	574,000	B.
April	3,880	2,730	3,400	2.34	2.61	202,000	A.
May	6,250	1,960	2,850	1.97	2.27	175,000	A.
June	1,790	1,090	1,410	.972	1.08	83,900	A.
July	1,090	760	927	.639	.74	57,000	A.
August	760	670	716	.494	.57	44,000	A.
September	1,090	670	718	.495	.55	42,700	A.
October	2,730	670	2,350	1.62	1.87	144,000	A.
November	51,100	670	6,260	4.32	4.82	372,000	B.
December	17,000	2,730	5,710	3 94	4.54	351,000	B.
The year	52,300	670	3,670	2.53	34.30	2,650,000	

WILLAMETTE RIVER AT ALBANY, OREG.

This station, which is located at the Corvallis & Eastern Railroad bridge within the city limits of Albany, Oreg., below the mouth of Callapooya River and 7 miles above the mouth of Santiam River, was established by the United States Geological Survey July 21, 1905.

The staff gage is attached to the second pier from the right bank and discharge measurements are made from the railroad bridge.

The United States Weather Bureau has recorded gage heights at Albany, Oreg., since 1879. On September 27, 1906, the Weather Bureau gage was moved from its former position on the steel highway bridge, 2,000 feet above the railroad bridge, to a better and more convenient site. The present gage is in two sections: The first is attached to one of the piers of the dock of Westgate Bros.; the high-water section is attached to their warehouse and is 30 feet nearer the shore.

Continuous records of gage heights have been obtained from the United States Geological Survey gage since the station was established, but as conditions are more favorable at the upper section, the Weather Bureau gage heights[1] have been used in computing the discharge. In constructing the rating curve for this gage the earlier measurements at medium and low stages have been plotted as coordinates with the Weather Bureau observer's reading for the day.

The gage heights for 1910 were furnished by the United States Weather Bureau.

The following measurement was made by R. W. Davenport:

July 30, 1910: Width 499 feet; area, 3,610 square feet; gage height, 0.90 foot (Weather Bureau gage); discharge, 3,190 second-feet.

[1] Monthly and yearly estimates of discharge for 1879, 1892 to 1908 were published in Water-Supply Paper U. S. Geol. Survey No. 252, 1910, pp. 354–358.

Daily gage height, in feet, of Willamette River at Albany, Oreg., for 1910.
[U. S. Weather Bureau, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.4	8.5	13.8	4.0	3.4	2.3	1.6	0.9	0.7	0.7	0.8	18.8
2	5.8	7.3	16.6	4.0	3.3	2.2	1.5	.8	.7	.7	.7	13.4
3	5.0	7.0	20.0	4.2	3.2	2.2	1.4	.8	.7	.8	.8	10.8
4	4.6	6.2	18.3	4.8	3.4	2.1	1.3	.8	.8	1.0	.8	12.7
5	4.2	5.8	16.0	4.6	3.7	2.0	1.3	.8	.8	2.3	.8	14.6
6	4.0	5.6	12.7	4.4	3.8	2.0	1.4	.8	.7	2.1	.8	12.3
7	3.8	5.4	10.0	4.5	3.6	2.0	1.4	.8	.7	1.7	1.0	10.1
8	4.6	5.2	9.4	4.4	3.5	2.0	1.3	.8	.7	1.4	1.3	8.6
9	5.0	5.0	8.4	4.3	3.4	1.9	1.3	.8	.7	1.2	4.7	7.9
10	4.9	4.8	7.6	4.3	3.4	1.9	1.3	.8	.6	1.1	4.7	9.2
11	4.7	5.1	7.1	4.5	4.8	1.8	1.2	.8	.6	1.0	4.6	8.2
12	4.3	5.3	6.8	4.4	5.7	1.9	1.2	.8	.6	1.0	5.0	7.3
13	4.0	5.5	6.6	4.6	5.1	2.2	1.1	.8	.6	1.0	4.2	6.6
14	4.0	7.0	6.7	4.5	4.5	2.0	1.2	.8	.6	1.0	3.4	6.0
15	4.1	8.6	6.7	4.4	4.2	1.9	1.2	.8	.6	1.1	2.9	5.5
16	3.9	8.2	6.7	4.0	3.9	1.8	1.2	.8	.6	1.1	2.5	5.1
17	3.8	7.3	6.3	3.8	3.6	1.8	1.1	.7	.6	1.0	2.2	5.2
18	3.8	6.5	6.0	3.8	3.3	1.9	1.1	.7	.6	1.0	2.1	7.5
19	4.3	7.5	5.9	3.8	3.2	1.9	1.1	.7	.7	1.0	2.2	7.0
20	6.4	9.9	6.2	4.0	3.0	1.8	1.1	.7	.7	1.0	2.7	6.2
21	6.0	9.5	5.9	4.2	2.9	1.8	1.0	.7	.8	1.0	3.0	5.6
22	5.8	9.0	5.6	4.1	2.8	2.0	1.0	.7	1.0	1.0	4.8	5.2
23	7.2	8.3	5.7	4.0	2.7	2.0	1.0	.7	1.1	1.0	7.2	4.8
24	9.6	9.0	6.9	3.9	2.7	1.9	1.0	.7	.8	.9	10.9	4.6
25	10.4	10.2	6.4	3.9	2.7	1.9	1.0	.7	.8	.9	9.5	5.1
26	9.7	12.5	5.8	4.1	2.7	1.9	1.0	.7	.8	.9	7.2	5.2
27	9.0	12.4	5.3	4.0	2.7	1.7	1.0	.7	.7	.9	5.9	5.0
28	8.4	12.4	5.0	3.9	2.6	1.6	.9	.7	.7	.8	6.0	5.0
29	10.0	.....	4.7	3.7	2.6	1.6	.9	.7	.7	.8	12.3	4.8
30	10.2	.....	4.4	3.5	2.5	1.6	.9	.7	.7	.8	17.6	4.8
31	9.0	.....	4.2	.....	2.4	.....	.9	.7	.....	.8	.....	5.4

Daily discharge, in second-feet, of Willamette River at Albany, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	18,200	26,300	51,900	10,600	8,950	6,210	4,580	3,140	2,760	2,760	2,950	82,400
2	16,100	23,400	68,200	10,600	8,690	5,970	4,360	2,950	2,760	2,760	2,760	49,800
3	13,600	20,300	90,500	11,200	8,430	5,970	4,150	2,950	2,760	2,950	2,950	36,700
4	12,400	17,500	79,100	13,000	8,950	5,730	3,940	2,950	2,950	3,330	2,950	46,100
5	11,200	16,100	64,500	12,400	9,760	5,500	3,940	2,950	2,950	6,210	2,950	56,200
6	10,600	15,500	46,100	11,800	10,000	5,500	4,150	2,950	2,760	5,730	2,950	44,000
7	10,000	14,800	33,000	12,100	9,490	5,500	4,150	2,950	2,760	4,810	3,330	33,500
8	12,400	14,200	30,300	11,800	9,220	5,500	3,940	2,950	2,760	4,150	3,940	26,800
9	13,600	13,600	25,900	11,500	8,950	5,270	3,940	2,950	2,760	3,730	12,700	23,800
10	13,300	13,000	22,600	11,500	8,950	5,270	3,940	2,950	2,580	3,530	12,700	29,400
11	12,700	13,900	20,700	12,100	13,000	5,040	3,730	2,950	2,580	3,330	12,400	25,000
12	11,500	14,500	19,600	11,800	15,800	5,270	3,730	2,950	2,580	3,330	13,600	21,400
13	10,600	15,200	18,900	12,400	13,900	5,970	3,530	2,950	2,580	3,330	11,200	18,900
14	10,600	20,300	19,200	12,100	12,100	5,500	3,730	2,950	2,580	3,330	8,950	16,800
15	10,900	26,800	19,200	11,800	11,200	5,270	3,730	2,950	2,580	3,530	7,670	15,200
16	10,300	25,000	19,200	10,600	10,300	5,040	3,730	2,950	2,580	3,530	6,690	13,900
17	10,000	21,400	17,800	10,000	9,490	5,040	3,530	2,760	2,580	3,330	5,970	14,200
18	10,000	18,500	16,800	10,000	8,690	5,270	3,530	2,760	2,580	3,330	5,730	22,200
19	11,500	22,200	16,500	10,000	8,430	5,270	3,530	2,760	2,760	3,330	5,970	20,300
20	18,200	32,500	17,500	10,600	7,920	5,040	3,530	2,760	2,760	3,330	7,170	17,500
21	16,800	30,700	16,500	11,200	7,670	5,040	3,330	2,760	2,950	3,330	7,920	15,500
22	16,100	28,500	15,500	10,900	7,420	5,500	3,330	2,760	3,330	3,330	13,000	14,200
23	21,000	25,500	15,800	10,600	7,170	5,500	3,330	2,760	3,530	3,330	21,000	13,000
24	31,200	28,500	19,900	10,300	7,170	5,270	3,330	2,760	2,950	3,140	37,200	12,400
25	34,800	33,900	18,200	10,300	7,170	5,270	3,330	2,760	2,950	3,140	30,700	13,900
26	31,600	45,000	16,100	10,900	7,170	5,270	3,330	2,760	2,950	3,140	21,000	14,200
27	28,500	44,500	14,500	10,600	7,170	4,810	3,330	2,760	2,760	3,140	16,500	13,600
28	25,900	44,500	13,600	10,300	6,930	4,580	3,140	2,760	2,760	2,950	16,800	13,600
29	33,000	.....	12,700	9,760	6,930	4,580	3,140	2,760	2,760	2,950	44,000	13,000
30	33,900	.....	11,800	9,220	6,690	4,580	3,140	2,760	2,760	2,950	74,500	13,000
31	28,500	.....	11,200	.....	6,450	.....	3,140	2,760	.....	2,950	.....	14,800

NOTE.—Daily discharge determined from a rating curve well defined between 2,700 and 13,600 second-feet and fairly well defined above.

Monthly discharge of Willamette River at Albany, Oreg., for 1910.

[Drainage area, 4,860 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	34,800	10,000	17,700	3.64	4.20	1,090,000	A.
February	45,000	13,000	23,800	4.90	5.10	1,320,000	A.
March	90,500	11,200	27,800	5.72	6.60	1,710,000	A.
April	13,000	9,220	11,100	2.28	2.54	660,000	A.
M y	15,800	6,450	9,040	1.86	2.14	556,000	A.
June	6,210	4,580	5,320	1.09	1.22	317,000	A.
July	4,580	3,140	3,650	.751	.87	224,000	A.
August	3,140	2,760	2,860	.588	.68	176,000	A.
September	3,530	2,580	2,790	.574	.64	166,000	A.
October	6,210	2,760	3,480	.716	.83	214,000	A.
November	74,500	2,760	13,900	2.86	3.19	827,000	A.
December	82,400	12,400	24,700	5.08	5.86	1,520,000	A.
The year	90,500	2,580	12,100	2.49	33.87	8,780,000	

WILLAMETTE RIVER AT SALEM, OREG.

Gage readings have been kept at Salem by the United States Weather Bureau since January 1, 1892, but they are continuous through the summer low-water periods only since 1904.

Measurements were begun by the United States Geological Survey in 1910, with a view to rating the station. Salem is about 25 miles by river below the mouth of Santiam River, and the station is below the mouth of Mill Creek, which carries a considerable quantity of water diverted from North Fork of Santiam River near Stayton in addition to the discharge from its own drainage area.

Discharge measurements are made from the steel highway bridge between Salem and West Salem. The Weather Bureau gage is a vertical staff in sections attached to the dock of the Oregon-Washington Railroad & Navigation Co. The gage of the United States Engineer Department, located near the same point and at a datum 0.4 foot lower than the Weather Bureau gage, was read during a part of 1904 and 1905, but these readings have been reduced to the datum of the Weather Bureau gage.

Discharge measurements of Willamette River at Salem, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Feet.*	*Sec.-ft.*
Sept. 18	F. F. Henshaw	490	7,340	—.58	3,550
Oct. 14	F. C. Ebert	506	7,890	+.15	5,720

Daily gage height, in feet, of Willamette River at Salem, Oreg., for 1910.

[U. S. Weather Bureau, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.8	8.2	14.4	3.4	2.9	1.5	0.5	−0.4	−0.6	−0.7	−0.4	15.5
2	4.8	7.3	18.1	3.3	2.8	1.5	.5	− .4	− .6	− .7	− .4	13.5
3	4.2	6.5	20.8	4.0	2.7	1.4	.5	− .4	− .6	− .4	− .5	10.8
4	3.7	5.8	19.6	4.3	2.9	1.3	.4	− .4	− .6	+ .7	− .5	12.7
5	3.5	5.2	16.3	4.1	3.4	1.2	.4	− .4	− .6	1.9	− .5	13.5
6	3.3	4.9	13.1	4.1	3.4	1.1	.3	− .5	− .6	2.1	− .3	12.2
7	3.2	4.7	11.0	4.1	3.2	1.1	.3	− .5	− .7	1.5	− .1	9.8
8	3.9	4.5	9.2	4.2	3.0	1.1	.3	− .5	− .7	.9	+2.6	8.5
9	4.2	4.3	8.0	4.5	3.0	1.0	.2	− .5	− .7	.5	5.2	8.3
10	4.1	4.2	7.3	4.4	2.9	.9	.2	− .5	− .7	.3	6.0	8.6
11	3.9	4.4	6.8	4.6	3.7	.9	.2	− .5	− .7	.2	6 9	7.8
12	3.7	4.9	6.5	4.7	4.7	1.1	.1	− .5	− .7	.1	6.5	6.8
13	3.5	5.1	6.5	4.5	4.3	1.3	.1	− .5	− .7	.1	5.0	6.1
14	3.3	7.7	6.7	4.4	3.9	1.1	.1	− .5	− .7	.0	3.9	5.5
15	3.3	8.2	6.7	4.2	3.4	1.0	.0	− .5	− .7	.1	3.1	4.9
16	3.3	7.8	6.6	3.8	3.1	.9	− .1	− .5	− .7	.1	2.6	4.5
17	3.2	6.8	6.3	3.7	2.9	.8	− .1	− .5	− .7	− .1	2.3	4.5
18	3.1	6.3	6.0	3.6	2.7	.9	− .1	− .6	− .6	− .1	2.0	5.7
19	4.8	7.3	5.9	3.7	2.5	.9	− .1	− .6	− .6	+ .7	2.3	5.8
20	6.0	8.7	6.1	3.9	2.4	.8	− .1	− .6	− .6	+ .5	2.5	5.1
21	5.5	8.7	5.8	4.0	2.2	.9	− .1	− .6	− .6	+ .3	4.5	4.7
22	5.9	8.2	5.3	3.9	2.1	.9	− .1	− .6	− .3	+ .1	8.0	4.3
23	7.8	7.6	5.5	3.7	2.1	1.1	− .1	− .6	− .3	− .1	9.0	4.0
24	10.5	8.8	6.1	3.7	2.0	1.1	− .2	− .6	− .4	− .1	11.1	3.9
25	11.3	11.1	5.7	3.8	2.0	1.0	− .2	− .6	− .4	− .2	10.2	4.7
26	10.1	12.5	5.1	3.9	2.0	.9	− .2	− .6	− .5	− .2	7.5	4.7
27	8.8	12.5	4.7	3.7	2.0	.7	− .2	− .6	− .6	− .3	5.9	4.5
28	9.5	12.5	4.4	3.4	1.9	.7	− .3	− .6	− .7	− .3	6.0	4.4
29	10.0	.....	4.1	3.1	1.8	.6	− .3	− .6	− .7	− .4	10.0	4.3
30	9.7	.....	3.8	2.9	1.7	.6	− .3	− .6	− .7	− .4	14.2	4.2
31	8.7	.....	3.6	.....	1.6	.....	− .3	− .6	.....	− .4	.....	4.8

WILLAMETTE RIVER AT OREGON CITY, OREG.

This station is located about a mile below the falls at Oregon City, Oreg., and above Clackamas Rapids.

Gage heights are obtained from a vertical staff gage at the foot of the falls in the lower locks, and have been recorded since August 19, 1883. The gage heights are affected by backwater from Columbia River at high stages, and probably by backwater from Clackamas River at high stages of that stream, but during the summer months the gage heights should be fairly good index of the discharge. The station was established by the Portland Railway, Light & Power Co., with the intention of developing a discharge curve to which the old gage heights during the summer months could be applied.

At ordinary stages the waters of Willamette River at this point are entirely used for power development. The Portland Railway, Light & Power Co. has the major interest in the water rights at this point. Besides furnishing power for municipal uses at Portland, the company leases power to the several paper mills at Oregon City. The aggregate installation of power wheels probably amounts to

40,000 horsepower, but there is only sufficient water to develop 10,000 horsepower at low stages of the river. During such periods the paper mills are obliged to use steam power or suspend work. The Portland Railway, Light & Power Co. also owns and operates the locks at this point. The fall of the river at low water is about 41 feet, and a dam has been constructed around the brink of the falls where, by means of flashboards, the head is increased for low stages of the river. This causes backwater for many miles upstream, and it was impossible to select a site where a discharge curve could be developed for all stages of the river. The point selected was the only one in that vicinity where the determination of discharge could be made, and here the flow will be more or less under artificial control.

Discharge measurements are made from a boat held by a cable which is stretched across the river at the time of gaging. Up to the present time a sufficient number of measurements have not been made to develop a rating curve here.

The following measurement was made by Wert and Miller, of the Portland Railway, Light & Power Co.:

September 10, 1910: Width, 210 feet; area, 2,090 feet; gage height, 2.0 feet; discharge, 3,430 second-feet.

Daily gage height, in feet, of Willamette River at Oregon City, Oreg., for 1910.

[F. C. Miller, jr., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	9.85	15.35	22.0	9.1	12.9	12.65	6.7	3.6	2.35	2.0	2.35	19.25
2	10.3	14.5	24.35	9.0	12.95	12.5	6.4	3.45	2.25	2.15	2.4	19.65
3	9.75	14.1	27.0	9.45	12.85	12.4	6.1	3.2	2.4	3.05	2.25	18.55
4	8.95	12.55	27.75	10.3	12.7	12.4	6.0	3.3	2.0	4.2	2.3	18.4
5	8.3	11.9	26.75	10.15	12.8	12.4	6.45	3.1	2.25	5.9	2.3	19.1
6	8.1	11.5	23.75	10.1	12.7	12.3	6.45	3.05	2.1	6.25	2.25	18.8
7	8.0	11.1	20.65	10.15	12.65	11.8	6.05	2.7	2.0	5.9	3.65	17.05
8	8.8	10.6	18.15	10.9	12.55	11.45	5.9	2.95	2.0	4.95	6.1	15.5
9	9.55	10.35	16.0	11.7	12.65	11.2	5.7	2.95	1.9	4.05	9.95	15.15
10	9.65	10.05	14.65	11.4	12.8	10.8	5.8	2.75	2.05	3.9	11.95	15.05
11	9.45	10.25	13.8	11.5	13.35	10.6	5.45	2.7	1.85	3.4	14.15	14.4
12	9.05	10.85	13.25	11.8	14.35	10.4	5.15	2.65	1.85	3.05	13.75	13.45
13	8.8	11.7	13.1	11.65	15.0	10.15	4.9	2.5	2.0	2.9	12.05	12.45
14	8.6	13.8	13.2	11.45	15.35	10.0	4.75	2.15	1.95	2.95	10.3	11.65
15	8.55	14.6	13.25	11.3	15.3	9.85	4.6	2.45	1.8	3.2	8.95	11.0
16	8.3	14.4	13.1	10.95	15.25	9.65	4.35	2.5	2.05	2.9	8.0	10.45
17	8.55	13.7	12.8	10.45	15.0	9.6	4.35	2.5	2.1	3.15	7.45	10.15
18	9.15	13.1	12.5	10.25	14.6	9.35	4.3	2.45	2.2	3.25	6.95	10.7
19	11.85	13.7	12.4	10.2	14.2	9.0	4.35	2.6	2.5	3.15	6.9	11.35
20	12.8	14.6	12.5	10.3	13.95	9.0	4.35	2.45	2.25	4.10	7.25	10.75
21	12.6	15.0	12.3	10.5	13.65	8.9	4.5	2.3	2.25	3.85	11.05	10.1
22	13.1	14.75	12.05	10.65	13.3	8.7	4.4	2.6	2.35	3.25	15.05	9.5
23	15.05	14.25	12.45	10.75	13.15	8.45	4.35	2.4	2.45	3.10	16.75	9.25
24	17.9	15.15	13.1	11.05	12.75	8.35	4.25	2.25	2.4	2.90	17.6	9.5
25	18.5	17.95	13.35	11.4	12.55	8.1	4.2	2.3	2.45	2.90	17.2	10.15
26	17.8	19.1	12.95	11.55	12.55	7.6	4.0	2.3	2.2	2.80	15.0	10.6
27	16.65	19.85	12.15	11.75	12.65	7.6	3.85	2.25	2.1	2.60	13.2	10.3
28	16.1	20.45	11.5	12.1	12.85	7.2	3.8	2.2	2.05	2.45	12.7	10.05
29	16.5	.....	10.85	12.45	12.85	6.9	3.8	2.5	2.0	2.40	14.5	10.05
30	16.55	.....	10.1	12.85	13.0	6.8	3.65	2.15	2.05	2.40	17.8	9.85
31	16.0	.....	9.5	.....	13.0	.....	3.75	2.35	.....	2.45	.....	10.45

NORTH FORK OF MIDDLE FORK OF WILLAMETTE RIVER NEAR HAZELDELL, OREG.

This station, which is located half a mile above the confluence of the North Fork with the Middle Fork of Willamette River and half a mile below the Willamette military road crossing, was established October 12, 1909, by the Waldo Lake Irrigation & Power Co., which cooperates with the Geological Survey in its maintenance. A storage reservoir has been built at Waldo Lake, which makes possible the irrigation of considerable agricultural land in the lower valley. At present the waters are used principally for driving logs during the low-water season. No water was released during the low water of 1910.

The gage is a vertical staff on the right bank, spiked to a maple tree. The discharge measurements are made by wading at low water, or from the highway bridge half a mile above at high water. Both banks of the stream are high, and the bed of the stream is composed of gravel and cobblestones, and is fairly permanent.

The data at present available are insufficient for a determination of discharge.

The following discharge measurement was made by B. F. Heintzleman:

July 28, 1910: Width, 110 feet; area, 275 square feet; gage height, 1.35 feet; discharge, 137 second-feet.

Daily gage height, in feet, of North Fork of Middle Fork of Willamette River near Hazeldell, Oreg., for 1910.

[Mrs. A. C. Farrington, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.7	3.3	8.15	2.7	2.45	2.0	1.6	1.3	1.3	1.3	1.3	4.6
2	2.4	3.2	7.4	2.75	2.4	1.95	1.6	1.3	1.3	.....	1.3	4.8
3	2.4	3.05	6.4	2.8	2.45	1.9	1.55	1.3	1.3	.....	1.3	5.2
4	2.4	2.9	5.8	2.85	2.55	1.8	1.5	1.3	1.3	.....	1.3	5.0
5	2.4	2.8	5.4	2.9	2.5	1.7	1.5	1.3	1.3	.....	1.3	4.8
6	2.3	2.75	4.6	2.9	2.45	1.75	1.5	1.3	1.3	.....	1.3	4.4
7	2.35	2.7	4.35	2.85	2.5	1.7	1.5	1.3	1.3	.....	1.8	3.6
8	2.3	2.6	4.1	2.8	2.5	1.7	1.5	1.3	1.3	.....	2.95	4.0
9	2.25	2.55	4.0	2.85	2.8	1.7	1.5	1.3	1.3	.....	2.4	3.5
10	2.2	2.5	3.9	2.9	3.3	1.7	1.5	1.3	1.3	.....	2.2	3.0
11	2.2	2.7	3.8	2.9	3.2	1.7	1.5	1.3	1.3	.....	2.2	.....
12	2.15	2.65	3.7	2.9	3.0	1.75	1.45	1.3	1.3	.....	2.2	.....
13	2.1	2.65	3.6	2.9	2.85	1.7	1.45	1.3	1.3	.....	1.9	.....
14	2.1	2.6	3.65	2.8	2.7	1.7	1.45	1.3	1.3	.....	1.8	.....
15	2.1	2.6	3.7	2.7	2.6	1.7	1.4	1.3	1.3	.....	1.75	.....
16	2.05	2.65	3.75	2.7	2.5	1.7	1.4	1.3	1.3	.....	1.7	.....
17	2.0	2.6	3.8	2.8	2.4	1.7	1.4	1.3	1.3	.....	1.6	.....
18	2.1	2.9	3.85	2.9	2.3	1.65	1.4	1.3	1.35	.....	1.6	.....
19	2.3	3.4	3.9	3.1	2.25	1.65	1.4	1.3	1.35	.....	1.65	.....
20	2.3	3.2	3.7	3.15	2.2	1.75	1.4	1.3	1.35	.....	2.4	.....
21	2.5	3.15	3.5	3.0	2.0	1.9	1.4	1.3	1.35	.....	3.7	.....
22	2.7	2.95	3.8	2.9	2.15	1.8	1.4	1.3	1.3	.....	3.3	.....
23	3.8	3.0	3.9	2.95	2.1	1.85	1.4	1.3	1.3	.....	5.6	.....
24	3.5	3.1	3.4	3.0	2.1	1.7	1.4	1.3	1.3	.....	4.15	.....
25	3.25	3.7	3.2	3.05	2.05	1.8	1.4	1.3	1.3	.....	3.4	.....
26	3.4	3.6	3.1	3.0	2.0	1.7	1.4	1.3	1.3	.....	2.8	.....
27	3.7	3.8	2.9	2.85	2.0	1.6	1.4	1.3	1.3	.....	3.0	.....
28	4.0	5.5	2.8	2.7	2.0	1.6	1.35	1.3	1.3	.....	6.45	.....
29	3.65	.....	2.75	2.6	2.0	1.5	1.35	1.3	1.3	.....	6.85	.....
30	3.6	.....	2.7	2.5	2.0	1.6	1.35	1.3	1.3	1.3	5.3	.....
31	3.5	.....	2.65	.....	2.0	.....	1.3	1.3	.....	1.3	.....	.....

COAST FORK OF WILLAMETTE RIVER NEAR GOSHEN, OREG.

This station, which is located at a highway bridge 3 miles east of Goshen, 9 miles southeast of Eugene, 5 miles west of Jasper, Oreg., and 4 miles above the mouth of Coast Fork, was established August 23, 1905.

The gage is in two sections. The lower section is nailed vertically to an old pier in the center of the stream; the upper portion is painted on the lower bridge caisson on the left bank.

Discharge measurements are made from the highway bridge.

If storage could be supplied this fork of the Willamette would be valuable for both water-power and irrigation development.

Gages have washed out at times, but they have been replaced at the same datum, and no material inaccuracy in the records has been caused on this account.

Daily gage height, in feet, of Coast Fork of Willamette River near Goshen, Oreg., for 1910.

[J. D. West, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.9	3.4	8.6	2.5	0.95	0.85	0.65	0.3	0.2	0.2	0.3	4.7
2	3.4	3.3	7.9	2.5	.95	.75	.65	.3	.2	.3	.3	4.5
3	2.9	3.3	6.5	2.6	1.15	.75	.55	.25	.2	.4	.4	6.0
4	2.8	3.1	5.8	2.6	1.15	.75	.55	.25	.2	2.0	.35	5.4
5	2.5	2.9	5.2	2.6	1.05	.75	.55	.25	.2	1.2	.3	4.6
6	2.5	2.8	4.8	2.6	1.05	.75	.55	.2	.2	.8	.3	4.0
7	3.4	2.8	4.3	2.6	1.05	.75	.55	.2	.3	.75	.5	3.7
8	3.2	2.8	3.8	2.6	.95	.75	.5	.2	.2	.7	4.0	3.5
9	3.4	2.8	3.7	2.7	.95	.75	.5	.2	.2	.5	3.5	4.2
10	3.6	3.0	3.5	2.7	4.0	.75	.5	.2	.2	.4	1.9	4.1
11	3.2	3.0	3.3	2.7	3.6	.75	.45	.2	.2	.4	3.0	3.6
12	2.8	3.0	3.1	2.6	2.9	.75	.45	.2	.2	.5	2.5	3.3
13	2.5	3.2	3.0	2.6	2.6	.75	.45	.2	.2	.8	1.4	3.0
14	2.5	4.0	3.0	2.6	1.65	.75	.45	.2	.2	1.0	1.3	2.6
15	2.5	3.9	2.9	2.6	1.65	.75	.45	.2	.2	.6	1.1	2.5
16	2.5	3.6	2.7	1.65	1.45	.75	.45	.2	.3	.6	1.0	2.5
17	2.5	3.3	2.7	1.65	1.45	.75	.45	.2	.3	.5	1.0	2.7
18	2.5	3.7	2.6	1.45	1.25	.75	.45	.4	.3	.5	1.1	5.0
19	2.6	6.2	2.6	1.35	1.15	.75	.4	.2	.3	.5	1.6	4.6
20	2.6	6.0	2.6	1.35	1.15	.75	.4	.2	.6	.5	1.6	3.5
21	2.7	5.9	2.6	1.35	1.05	.75	.4	.2	.65	.5	1.8	3.3
22	2.7	5.8	2.6	1.35	1.05	.75	.4	.2	.6	.4	4.0	3.0
23	3.2	6.0	4.7	1.35	1.05	.65	.4	.2	.5	.5	6.6	2.9
24	3.5	6.2	4.3	1.25	.95	.65	.35	.2	.5	.4	5.0	3.3
25	3.6	6.5	3.8	1.05	.95	.65	.35	.2	.4	.4	3.6	3.1
26	4.1	5.9	3.3	1.05	.95	.65	.35	.2	.3	.3	3.4	3.1
27	4.3	5.5	3.1	1.05	.95	.65	.35	.2	.3	.35	3.5	3.3
28	5.6	6.7	2.9	.95	.95	.65	.35	.4	.3	.35	10.2	3.2
29	5.8	.....	2.7	.95	.95	.65	.35	.3	.3	.4	12.2	3.1
30	4.6	.....	2.6	.95	.85	.65	.35	.2	.25	.3	7.5	3.3
31	3.5	.....	2.5	.....	.85	.....	.3	.2	.....	.3	.....	3.7

NOTE.—Gage heights between 2.5 and about 4 feet subject to considerable uncertainty, as this portion of the gage was very indistinctly graduated during the early part of 1910. The low-water gage heights are good.

ROW RIVER NEAR DISSTON, OREG.

This station, which is located in sec. 30, T. 21 S., R. 1 E., at the Prather Creek ranger station, 2 miles above Disston, Oreg., on the Oregon & Southeastern Railroad grade, was established September 27, 1910, in cooperation with the United States Forest Service.

Discharge measurements are made by wading in the vicinity of the gage. Gage readings are somewhat scattering, and no estimates of daily or monthly discharge are yet possible.

Discharge measurements of Row River near Disston, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 27	B. F. Heintzelman	12	8.9	0.94	7.0
Oct. 18	do	12.6	13	1.25	13.0

Daily gage height, in feet, of Row River near Disston, Oreg., for 1910.

[E. S. Holderman, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	0.9	3.2	11	1.2	2.2	2.7	21	1.1	2.85	.....
2	.....	.9	2.9	12	1.4	2.2	2.5	22	1.1	3.0	.....
3	1.2	1.1	3.45	13	1.3	2.1	2.5	23	1.1	4.9	.....
4	2.2	1.0	3.6	14	1.3	1.8	2.4	24	1.0	3.1	.....
5	1.9	1.0	3.1	15	1.2	1.7	2.4	25	1.0	2.9	.....
6	.....	1.0	2.8	16	1.1	1.6	2.3	26	.....	2.6	.....
7	.....	1.6	2.7	17	1.1	1.5	2.9	27	.....	3.0	.....
8	1.2	.....	2.75	18	1.3	2.1	.....	28	.....	5.85	.....
9	1.1	.....	3.4	19	1.2	2.0	.....	29	.9	5.1	.....
10	1.1	.....	3.0	20	1.1	2.1	.....	30	.9	3.8	.....
								31	.9	.....	.....

M'KENZIE RIVER BASIN.

McKENZIE RIVER AT McKINZIE BRIDGE, OREG.

This station, which was located at the Paradise ranger station, 2 miles above McKinzie Bridge, Oreg., about 3 miles below the mouth of Lost Creek and about 4 miles above Horse Creek, was established August 8, 1910, in cooperation with the United States Forest Service.

Owing to the fact that it has been impossible to get continuous gage readings at the ranger station, a second gage was installed in sec. 14, T. 16 S., R. 5 E., at the highway bridge at McKinzie Bridge, Oreg., and is referred to as the lower gage.

The first discharge measurements were made from this highway bridge but later a cable was installed at a point about 2½ miles above the bridge, and all future measurements will be made from this cable and referred to both gages.

Discharge measurements of McKenzie River at McKinzie Bridge, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.		Discharge.
				Ranger station.	Lower gage.	
		Feet.	*Sq. ft.*	*Feet.*	*Feet.*	*Sec.-ft.*
Aug. 8	B. F. Heintzelman	108	292	1.75	.....	1,240
Oct. 12	do	108	274	1.60	2.00	1,130
Dec. 19	do	132	512	2.27	2.75	1,790

Daily gage height, in feet, of McKenzie River at Paradise ranger station, near McKinzie Bridge, Oreg., for 1910.

[Gage at ranger station. S. L. Taylor, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1			1.6		2.95	16			1.6		
2			1.6		3.05	17					2.3
3			1.7		3.6	18	1.7				2.3
4			1.75		3.4	19					2.3
5					3.2	20					2.2
6					3.0	21					2.2
7					2.8	22					2.15
8	1.75				2.9	23			1.55		2.15
9	1.75		1.55		3.1	24			1.55		2.2
10	1.75		1.55		2.85	25			1.55	2.35	2.15
11	1.7		1.55		2.8	26		1.55	1.55	2.3	2.1
12	1.65		1.6		2.8	27		1.55	1.55	2.3	2.1
13			1.55		2.6	28		1.55	1.5	2.7	2.1
14					2.55	29		1.55	1.5	3.4	2.1
15					2.45	30		1.55	1.5	3.2	2.1
						31			1.5		

Daily gage height, in feet, of McKenzie River at McKinzie Bridge, Oreg., for 1910.

[Lower gage. Frances Arnold, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1		1.9	3.5	11		2.5		21		3.6	2.7
2		1.9	3.7	12		2.4	3.1	22	1.9	3.8	2.6
3		1.9	4.3	13	2.0	2.2	3.1	23		4.0	2.6
4		1.9	4.0	14		2.2	3.0	24		3.4	
5		1.9	3.7	15		2.2	2.9	25		3.2	
6		1.9	3.5	16		2.2	3.0	26	1.9	3.1	
7		2.3	3.4	17		2.2	2.9	27		3.2	
8		2.5	3.5	18		2.2	2.9	28	1.9	3.4	
9		2.5	3.3	19		2.2	2.8	29	1.9	4.1	
10		2.7	3.2	20		3.3	2.8	30	1.9	3.7	
								31	1.9		

McKENZIE RIVER AT MARTINS RAPIDS, NEAR VIDA, OREG.

This station, which is located in SW. ¼ sec. 36, T. 16 S., R. 2 E., was established June 25, 1910, by H. M. Byllesby & Co., engineers, by whom the results are furnished to the United States Geological Survey.

Gate Creek, a small tributary, enters about 3 miles below. This creek and other confluents below the station probably contribute a relatively insignificant amount of water.

The drainage area above the station is 844 square miles.

The vertical staff gage is located at the dam site at the head of Martins Rapids, and measurements are made from a boat near the gage.

The section is permanent and conditions for measuring are good.

Discharge measurements of McKenzie River at Martins Rapids, near Vida, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 25	W. T. Hanna	230	1,180	2.9	2,480
July 7	do	230	1,160	2.6	2,200
18	do	230	1,090	2.5	1,960
19	do	230	1,090	2.5	2,020

NOTE.—Measurements made from boat. No gage heights for measurements reported; observer's reading for day used, except that of June 25, which is estimated from comparisons with Springfield station.

Daily gage height, in feet, of McKenzie River at Martins Rapids, near Vida, Oreg., for 1910.

[Jas. Reside, observer.]

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.7	2.4	2.3	2.2	2.2	5.3	16	2.5	2.3	2.2	2.3	2.7	4.1
2	2.7	2.4	2.3	2.3	2.2	5.2	17	2.5	2.3	2.2	2.3	2.6	4.9
3	2.7	2.4	2.3	2.5	2.2	6.3	18	2.5	2.3	2.2	2.5	2.8	4.2
4	2.7	2.4	2.3	2.4	2.2	6.6	19	2.5	2.3	2.2	2.4	2.9	3.7
5	2.7	2.4	2.3	2.8	2.2	5.3	20	2.5	2.3	2.3	2.3	2.9	3.6
6	2.6	2.4	2.3	2.7	2.2	5.0	21	2.5	2.3	2.3	2.3	4.4	3.3
7	2.6	2.4	2.3	2.4	2.2	4.5	22	2.5	2.3	2.2	2.3	5.8	3.1
8	2.6	2.4	2.3	2.4	4.5	4.3	23	2.5	2.3	2.2	2.3	8.7	3.1
9	2.6	2.4	2.2	2.3	3.6	5.4	24	2.4	2.3	2.2	2.0	5.6	3.6
10	2.6	2.3	2.2	2.3	3.7	4.8	25	2.4	2.3	2.2	2.3	4.2	3.6
11	2.6	2.3	2.2	2.3	4.2	4.4	26	2.4	2.3	2.2	2.3	3.5	3.2
12	2.6	2.3	2.2	2.4	3.5	4.2	27	2.4	2.3	2.2	2.2	3.6	3.2
13	2.5	2.3	2.2	2.4	3.1	4.0	28	2.4	2.3	2.2	2.2	5.8	3.1
14	2.5	2.3	2.3	2.3	2.9	3.7	29	2.4	2.3	2.2	2.2	8.4	3.1
15	2.5	2.3	2.2	2.3	2.8	3.8	30	2.4	2.3	2.2	2.2	6.8	3.3
							31	2.4	2.3	.....	2.2	.....	3.3

McKENZIE RIVER NEAR SPRINGFIELD, OREG.

This station, which is located at Hendricks Ferry—an old river crossing that was replaced by a highway bridge in 1908—11 miles above Springfield, 3 miles below Waterville, 4 miles above Thurston, Oreg., and 3 miles above the mouth of Camp Creek, was established September 12, 1905.

A vertical staff is spiked to a small willow tree on the left bank about 250 feet above the cable station.

Discharge measurements are made from a cable. Those taken during high water in the past are not very reliable. Individual measurements at low and medium stages can be made with accuracy.

The conditions of this station do not favor accurate results. The stream is extensively used for floating logs during all seasons of the year, and the gage records have been greatly influenced by this use. Individual daily records may be considerably in error, although it is probable that this error diminishes rapidly as records of longer periods are considered.

Discharge measurements of McKenzie River near Springfield, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 6	Henshaw and Davenport	255	824	0.97	2,080
Oct. 20	B. F. Heintzelman	256	776	.95	1,850

Daily gage height, in feet, of McKenzie River near Springfield, Oreg., for 1910.

[Mrs. N. M. Hendricks, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.6	3.4	8.25	2.5	2.9	1.8	1.4	1.1	0.75	0.9	0.8	5.5
2	2.6	3.6	8.0	2.8	2.8	1.8	1.35	1.1	.75	.9	.8	4.65
3	2.5	3.4	6.7	3.0	2.9	1.75	1.3	1.1	.80	1.9	.8	5.6
4	2.5	3.0	6.0	3.0	2.9	1.75	1.3	1.1	.8	2.1	.8	5.4
5	2.4	3.0	5.65	3.1	2.8	1.75	1.3	1.05	.8	1.5	.7	5.0
6	2.3	2.9	5.4	3.1	2.7	1.7	1.25	1.0	.85	1.2	.8	4.35
7	2.3	2.7	5.0	3.0	2.6	1.8	1.25	1.0	.85	1.05	1.4	4.0
8	2.3	3.0	4.3	3.0	2.8	1.8	1.25	1.0	1.05	.95	3.95	4.0
9	2.3	3.0	4.1	3.0	2.9	1.8	1.25	1.0	1.05	.9	2.4	4.6
10	2.3	3.6	4.0	3.0	3.9	1.8	1.25	1.0	1.05	.9	2.75	3.8
11	2.2	3.5	4.1	3.0	3.6	2.0	1.25	.95	1.05	.9	3.3	3.7
12	2.1	3.7	4.2	2.9	3.5	2.0	1.25	.95	.8	1.0	2.5	3.6
13	2.1	3.7	4.3	3.0	3.0	1.8	1.2	.95	.85	1.0	2.0	3.4
14	2.0	3.75	4.2	2.9	2.8	1.8	1.2	.9	.85	1.1	1.9	3.2
15	2.0	3.5	4.0	2.8	2.8	2.0	1.15	.9	.85	1.0	1.7	3.0
16	2.0	3.4	4.1	2.8	2.5	1.6	1.15	.9	.85	1.1	1.5	3.0
17	2.0	3.0	4.0	2.9	2.4	1.6	1.15	.9	.85	1.1	1.4	3.3
18	2.1	3.6	3.9	2.8	2.3	1.6	1.15	.9	.85	1.1	1.65	3.2
19	3.0	3.8	3.8	2.9	2.2	1.6	1.15	.9	.85	1.05	1.8	2.9
20	2.8	3.9	3.8	3.0	2.1	1.6	1.15	.9	.85	1.0	3.0	2.7
21	2.9	3.6	3.7	3.1	2.1	1.5	1.15	.9	.85	.95	4.35	2.6
22	3.55	3.8	3.0	2.5	2.1	1.8	1.15	.9	.85	.9	4.5	2.5
23	4.65	3.85	2.9	2.4	2.1	1.7	1.1	.85	.85	.9	6.8	2.45
24	4.0	4.1	2.3	2.3	2.0	1.7	1.1	.85	.85	.95	4.4	2.8
25	4.0	5.0	2.7	2.9	2.0	1.6	1.1	.85	.85	.85	4.0	2.8
26	3.6	4.9	2.2	3.0	2.0	1.45	1.1	.85	.8	.85	3.2	2.5
27	3.7	4.9	2.1	2.9	1.9	1.4	1.1	.85	.8	.8	3.1	2.6
28	3.6	6.4	2.0	2.9	1.9	1.4	1.1	.85	.75	.8	6.35	2.5
29	3.75	.....	1.9	2.8	1.9	1.4	1.1	.8	.75	.8	7.3	2.5
30	3.8	.....	2.1	2.8	1.9	1.4	1.1	.8	.9	.8	6.9	2.7
31	3.7	.....	2.2	.....	1.8	.....	1.1	.8	.....	.8	.....	2.85

NOTE.—Gage heights affected by a log jam which formed Sept. 8 and was released Sept. 12.

Daily discharge, in second-feet, of McKenzie River near Springfield, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,720	6,620	23,500	4,500	5,380	3,120	2,450	2,050	1,680	1,820	1,720	12,200
2	4,720	7,190	22,500	5,160	5,160	3,120	2,380	2,050	1,680	1,820	1,720	9,400
3	4,500	6,620	17,400	5,600	5,380	3,030	2,310	2,050	1,720	3,300	1,720	12,500
4	4,500	5,600	14,900	5,600	5,380	3,030	2,310	2,050	1,720	3,680	1,720	11,900
5	4,280	5,600	13,700	5,840	5,160	3,030	2,310	1,990	1,720	2,600	1,630	10,500
6	4,080	5,380	12,800	5,840	4,940	2,940	2,240	1,930	1,770	2,180	1,720	8,490
7	4,080	4,940	11,500	5,600	4,720	3,120	2,240	1,930	1,770	1,990	2,450	7,460
8	4,080	5,600	9,270	5,600	5,160	3,120	2,240	1,930	1,760	1,880	8,200	7,460
9	4,080	5,600	8,650	5,600	5,380	3,120	2,240	1,930	1,750	1,820	4,280	9,240
10	4,080	7,190	8,350	5,600	8,060	3,120	2,240	1,930	1,740	1,820	5,050	6,890
11	3,880	6,900	8,650	5,600	7,190	3,480	2,240	1,880	1,730	1,820	6,340	6,610
12	3,680	7,480	8,960	5,380	6,900	3,480	2,240	1,880	1,720	1,930	4,500	6,340
13	3,680	7,480	9,270	5,600	5,600	3,120	2,180	1,880	1,770	1,930	3,480	5,820
14	3,480	7,620	8,960	5,380	5,160	3,120	2,180	1,820	1,770	2,050	3,300	5,350
15	3,480	6,900	8,350	5,160	5,160	3,480	2,120	1,820	1,770	1,930	2,940	4,920
16	3,480	6,620	8,650	5,160	4,500	2,770	2,120	1,820	1,770	2,050	2,600	4,920
17	3,480	5,600	8,350	5,380	4,280	2,770	2,120	1,820	1,770	2,050	2,450	5,580
18	3,680	7,190	8,060	5,160	4,080	2,770	2,120	1,820	1,770	2,050	2,860	5,350
19	5,600	7,770	7,770	5,380	3,880	2,770	2,120	1,820	1,770	1,990	3,120	4,710
20	5,160	8,060	7,770	5,600	3,680	2,770	2,120	1,820	1,770	1,930	5,600	4,320
21	5,380	7,190	7,480	5,840	3,680	2,600	2,120	1,820	1,770	1,880	9,420	4,130
22	7,040	7,770	5,600	4,500	3,680	3,120	2,120	1,820	1,770	1,820	9,900	3,950
23	10,400	7,920	5,380	4,280	3,680	2,940	2,050	1,770	1,770	1,820	17,800	3,860
24	8,350	8,650	4,080	4,080	3,480	2,940	2,050	1,770	1,770	1,880	9,580	4,510
25	8,350	11,500	4,940	5,380	3,480	2,770	2,050	1,770	1,770	1,770	8,350	4,510
26	7,190	11,200	3,880	5,600	3,480	2,520	2,050	1,770	1,720	1,770	6,080	3,950
27	7,480	11,200	3,680	5,380	3,300	2,450	2,050	1,770	1,720	1,720	5,840	4,130
28	7,190	16,300	3,480	5,380	3,300	2,450	2,050	1,770	1,680	1,720	16,200	3,950
29	7,620	.....	3,300	5,160	3,300	2,450	2,050	1,720	1,680	1,720	18,700	3,950
30	7,770	.....	3,680	5,160	3,300	2,450	2,050	1,720	1,820	1,720	17,100	4,320
31	7,480	.....	3,880	.....	3,120	.....	2,050	1,720	.....	1,720	.....	4,610

NOTE.—Daily discharge determined from a fairly well-defined rating curve.

Monthly discharge of McKenzie River near Springfield, Oreg., for 1910.

[Drainage area, 960 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	10,400	3,480	5,390	5.61	6.47	331,000	B.
February	16,300	4,940	7,630	7.95	8.28	424,000	B.
March	23,500	3,300	8,930	9.30	10.72	549,000	B.
April	5,840	4,080	5,320	5.54	6.18	317,000	B.
May	8,060	3,120	4,610	4.80	5.53	283,000	B.
June	3,480	2,450	2,930	3.05	3.40	174,000	B.
July	2,450	2,050	2,170	2.26	2.61	133,000	B.
August	2,050	1,720	1,860	1.94	2.24	114,000	B.
September	1,820	1,680	1,750	1.82	2.03	104,000	B.
October	3,680	1,720	2,010	2.09	2.41	124,000	B.
November	18,700	1,630	6,210	6.47	7.22	370,000	B.
December	12,500	3,860	6,320	6.58	7.59	389,000	B.
The year	23,500	1,630	4,570	4.76	64.68	3,310,000	

SANTIAM RIVER BASIN.

GENERAL FEATURES.

Santiam River rises on the western slope of the Cascade Range in Marian and Linn counties, and flows westward to its junction with the Willamette near Buena Vista.

The stream system is composed of two very dissimilar branches, the North and South forks. The total annual amount contributed by each fork is approximately the same, but the flow of the South Fork is very irregular, the river falling very low in the summer time and being subject to excessive and violent floods. The North Fork, on the other hand, maintains a well-established flow during the low-water season. The stream is particularly valuable for its water powers, although it seems probable that extensive use will be made of its waters for irrigation in the near future.

NORTH FORK OF SANTIAM RIVER NEAR HOOVER,[1] OREG.

This station, which is located at the Forest Service bridge above Boulder Creek, in sec. 16, T. 10 S., R. 6 E., was established January 24, 1907, by J. G. Kelley, of Portland, who has cooperated with the Survey in its maintenance. The station was originally located at a footbridge 1 mile above Detroit, Oreg., about 1½ miles above the mouth of Breitenbush Creek, and 2 miles below the mouth of Boulder Creek.

Gage observations at the original site were discontinued October 31, 1909. On December 2, 1909, they were resumed on a gage near Tunnel Creek several miles farther upstream, and here they were continued until June 18, 1910. This gage was poorly located and could not be read closely; and as no measurements were referred to it, the readings are of no value and are not published.

A new gage was installed at the present site on August 19, 1910, by H. M. Byllesby & Co., engineers, who furnished to the Survey measurements and gage readings. Since November 1 the readings have been furnished by Mr. Kelley.

As the low-water flow is the value specifically sought, no particular effort has been made to determine the flood discharge, and only the low-water records have been computed.

Discharge measurements of North Fork of Santiam River near Hoover, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 19	J. H. Cave	100	358	1.50	438
Sept. 7	do	100	338	1.40	432
Oct. 5	F. C. Ebert	103	392	1.85	635
Nov. 16	J. H. Cave	100	388	1.95	696

[1] Formerly referred to as "near Detroit."

Daily gage height, in feet, of North Fork of Santiam River near Hoover, Oreg., for 1910.

[L. A. Harris, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.45	1.50	1.40	3.15	16	.....	1.40	1.52	1.95	2.47
2	.....	1.45	1.50	1.40	3.69	17	.....	1.40	1.60	1.88	2.42
3	.....	1.45	2.55	1.44	4.65	18	.....	1.40	.....	1.88	2.34
4	.....	1.45	2.42	1.43	4.33	19	.....	1.40	.....	1.84	2.27
5	.....	1.45	1.92	1.41	3.69	20	.....	1.64	1.51	2.15	2.24
6	.....	1.40	.....	1.44	3.34	21	.....	1.40	1.48	2.83	2.17
7	.....	1.40	1.64	2.14	3.32	22	.....	1.40	1.48	3.47	2.14
8	.....	1.40	1.55	2.61	3.55	23	.....	.....	1.48	4.57	2.15
9	.....	1.40	1.53	2.58	3.37	24	.....	.....	1.48	3.62	2.21
10	.....	1.40	1.52	3.30	3.21	25	.....	.....	1.48	3.08	2.22
11	.....	1.40	1.48	2.94	3.05	26	.....	1.45	.....	1.50	2.77	2.18
12	.....	1.40	1.60	2.71	2.86	27	.....	1.45	.....	1.46	2.64	2.15
13	.....	1.40	.....	2.40	2.70	28	.....	1.48	.....	1.42	3.01	2.11
14	.....	1.40	1.58	2.12	2.59	29	.....	1.50	1.40	1.42	3.70	2.08
15	.....	1.40	1.55	2.01	2.49	30	.....	1.45	1.32	1.42	3.43	2.13
						31	.....	1.45	.....	1.41	.....	2.09

NORTH FORK OF SANTIAM RIVER NEAR NIAGARA, OREG.

This station, which is located in sec. 29, T. 9 S., R. 4 E., about a mile below Niagara, was established November 5, 1908, by O'Neil Bros. & Callahan, owners of the power site, by whom the records are furnished to the United States Geological Survey.

Records were suspended December 17, 1910. The station is about 15 miles below the mouth of Breitenbush Creek. No large tributaries enter near the station.

The gage is a vertical staff.

Discharge measurements are made from a boat held by a tagged wire.

The channel is composed of large bowlders and is probably permanent except during extreme floods.

The station affords fairly good conditions for measurements except at extreme low water, when the current is rendered uneven by the rocks.

Discharge measurements of North Fork of Santiam River near Niagara, Oreg., in 1909–10.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1909.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 15	W. Meredith	.....	.....	1.73	751
1910.					
June 4	J. H. Cave	178	509	2.10	1,260
5	do	178	535	2.30	1,390
9	do	165	651	2.00	1,230
Aug. 17	do	165	531	1.40	722
Oct. 25	do	165	545	1.45	761
Nov. 16	do	165	668	2.35	1,590
17	do	165	668	2.29	1,580

Daily gage height, in feet, of North Fork of Santiam River near Niagara, Oreg., for 1908–1910.

[G. Knutsen, observer.]

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1908.			1908.			1908.		
1			11			21		2.1
2			12			22		2.3
3			13			23		2.8
4			14			24		2.8
5	3.5		15			25		2.6
6			16			26		3.1
7			17			27		3.3
8			18			28		4.2
9			19			29		4.2
10			20		2.1	30		3.6
						31		3.3

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	3.0	3.0	4.6	4.0	3.6	4.8	3.2	2.0	1.6	1.8	3.2	5.2
2	2.9	3.0	4.1	3.8	3.5	4.6	3.1	2.0	1.6	1.7	6.0	4.8
3	3.5	3.2	4.0	3.6	4.1	4.5	3.0	1.9	1.6	1.6	5.0	4.6
4	4.9	3.1	3.8	3.5	4.6	4.2	2.9	1.9	1.6	1.6	4.0	3.8
5	4.6	3.1	3.6	3.4	3.9	4.1	2.8	1.9	1.6	1.6	3.4	3.5
6	4.0	3.1	3.4	3.2	3.6	4.0	2.7	1.8	1.6	1.6	3.0	3.3
7	4.0	3.2	3.3	3.1	3.7	3.9	2.7	1.8	1.6	1.6	2.8	3.0
8	4.0	3.2	3.0	3.0	3.3	3.6	2.6	1.8	1.6	1.6	3.0	3.6
9	3.6	2.7	2.9	3.2	3.3	3.2	2.4	1.8	1.6	1.6	3.3	4.0
10	3.3	2.5	2.9	3.3	3.0	3.1	3.4	1.8	1.6	1.6	3.5	3.6
11	3.0	2.6	2.8	3.4	3.2	3.2	3.0	1.8	1.7	1.6	3.2	3.5
12	2.9	2.8	3.0	3.1	4.6	3.3	2.6	1.8	1.5	1.6	3.0	6.5
13	2.8	3.0	3.0	3.0	4.2	3.1	2.5	1.8	1.5	1.6	2.9	6.5
14	2.7	3.0	3.0	3.0	3.8	3.2	2.5	1.7	1.5	1.5	2.7	5.2
15	2.8	4.0	3.1	3.1	3.1	3.3	2.4	1.7	1.5	1.5	2.6	5.1
16	7.0	5.3	3.4	3.2	3.0	3.4	2.3	1.7	1.4	1.5	2.5	4.6
17	6.2	7.0	3.5	3.3	3.2	3.3	2.2	1.7	1.4	1.5	4.4	3.8
18	7.5	6.5	3.5	3.2	3.3	3.0	2.1	1.7	1.4	1.5	6.4	3.6
19	8.7	6.4	3.3	3.1	3.1	3.1	2.2	1.7	1.5	1.5	7.4	3.4
20	10.0	5.5	3.4	3.0	3.0	3.2	2.1	1.7	1.6	1.8	10.4	3.3
21	8.8	4.7	3.1	2.9	2.9	3.3	2.1	1.7	1.7	2.2	10.4	3.3
22	7.2	4.2	3.0	2.8	3.0	3.3	2.0	1.7	1.6	2.3	14.6	3.3
23	8.5	4.0	2.9	2.8	3.2	3.0	2.0	1.7	1.6	2.1	14.0	3.3
24	5.0	3.9	2.8	2.9	3.4	2.9	2.0	1.7	1.6	1.8	11.6	3.2
25	4.6	3.4	2.8	2.9	3.5	2.6	2.1	1.7	1.6	1.7	7.6	3.2
26	4.0	3.0	3.1	3.0	3.6	2.5	2.2	1.7	1.6	1.7	6.0	3.2
27	3.7	3.5	3.2	3.9	3.8	2.9	2.3	1.7	1.6	1.7	6.0	3.1
28	3.5	3.6	3.3	3.8	3.8	3.0	2.1	1.7	1.6	1.7	5.6	2.1
29	3.2	.....	3.4	3.7	3.9	3.1	2.1	1.6	1.8	2.1	5.5	2.2
30	3.1	.....	3.6	3.6	4.0	3.3	2.0	1.6	2.0	2.0	5.4	2.5
31	3.0	.....	3.4	.....	4.6	.....	2.0	1.6	.....	2.4	.....	3.0

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1910.											
1	3.3	3.4	9.0	3.1	3.0	2.5	1.9	1.5	1.3	1.4	1.3
2	2.6	3.3	10.0	3.3	3.0	2.3	1.8	1.5	1.3	1.4	1.3
3	2.5	3.2	8.3	3.5	2.9	2.2	1.8	1.5	1.3	1.5	1.3
4	2.4	2.9	7.0	3.4	3.0	2.1	1.8	1.5	1.3	1.5	1.3
5	2.4	2.8	5.0	3.4	3.1	2.3	1.8	1.5	1.3	1.5	1.4
6	2.4	2.8	4.6	3.5	3.2	2.2	1.8	1.5	1.3	1.6	1.4
7	2.5	2.9	4.5	3.4	3.2	2.1	1.8	1.5	1.3	1.6	1.4
8	2.3	2.8	4.4	3.5	3.3	2.1	1.8	1.5	1.3	1.6	4.3
9	2.3	2.6	4.4	3.6	3.4	2.0	1.8	1.5	1.3	2.0	3.7
10	2.2	2.8	4.2	3.1	3.6	2.0	1.8	1.5	1.3	2.0	5.0
11	2.2	2.9	4.0	3.8	4.6	2.3	1.8	1.5	1.3	2.0	4.9
12	2.2	3.0	4.0	3.8	3.9	2.2	1.8	1.5	1.3	2.0	3.8
13	2.1	3.0	4.3	3.7	3.8	2.1	1.7	1.4	1.3	1.8	3.1
14	2.1	3.3	4.5	3.6	3.0	.....	1.7	1.4	1.3	1.7	2.8
15	2.1	3.4	5.0	3.3	3.3	.....	1.7	1.4	1.3	1.6	2.6

Daily gage height, in feet, of North Fork of Santiam River near Niagara, Oreg., for 1908–1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1910.											
16	2.0	3.1	5.4	3.3	3.1	.....	1.7	1.4	1.3	1.6	2.3
17	2.2	3.0	5.4	3.3	3.0	.....	1.7	1.4	1.3	1.5	2.3
18	2.1	3.4	4.0	3.6	2.9	2.0	1.7	1.4	1.3	1.6	.....
19	2.4	3.5	4.4	4.0	2.8	2.0	1.7	1.4	1.3	1.5	.....
20	2.6	3.6	4.1	4.1	2.6	2.0	1.7	1.4	1.4	1.5	.....
21	3.0	3.4	4.3	3.9	2.5	2.1	1.7	1.4	1.5	1.5	.....
22	4.0	3.2	4.5	3.8	2.4	2.1	1.6	1.4	1.4	1.5	.....
23	5.7	3.0	4.7	4.0	2.4	2.1	1.6	1.4	1.4	1.5	.....
24	6.1	3.0	4.2	4.1	2.2	2.0	1.6	1.4	1.4	1.5	.....
25	5.1	3.8	3.9	4.2	2.3	2.0	1.6	1.4	1.4	1.45	.....
26	4.2	5.5	3.8	4.0	2.4	2.0	1.6	1.4	1.4	1.4	.....
27	4.6	4.7	3.4	3.6	2.6	2.0	1.6	1.4	1.3	1.3	.....
28	4.4	4.8	3.3	3.3	2.5	1.9	1.6	1.4	1.3	1.3	.....
29	4.2	.....	3.2	3.1	2.4	1.9	1.6	1.3	1.3	1.3	.....
30	3.3	.....	3.1	3.1	2.5	1.9	1.5	1.3	1.3	1.3	.....
31	3.5	.....	3.0	.....	2.5	.....	1.5	1.3	.....	1.3	.....

NORTH FORK OF SANTIAM RIVER AT MEHAMA, OREG.

This station, which is located in sec. 18, T. 9 S., R. 2 E., just below the highway bridge at Mehama, Oreg., about 1½ miles north of Lyons, the nearest railroad station, and about 12 miles below the junction of Little North Fork and North Fork, was established July 11, 1905, discontinued March 31, 1907, and reestablished October 11, 1910.

Discharge measurements are made at the highway bridge just above the gage. The gage datum is the same as that used when the station was first maintained.

A good rating curve has been constructed, and the records may be considered reliable.

The following measurement was made by F. C. Ebert:

October 11, 1910: Width, 164 feet; area, 680 square feet; gage height, 2.48 feet; discharge, 888 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of North Fork of Santiam River at Mehama, Oreg., for 1910.

[J. W. Irvine, observer.]

Day.	October.		November.		December.		Day.	October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.3	740	5.8	7,200	16	2.5	920	3.5	2,100	4.1	3,080
2	.....	.....	2.3	740	6.5	9,420	17	3.1	1,560	3.3	1,820	4.1	3,080
3	.....	.....	2.3	740	8.6	17,500	18	3.1	1,560	3.5	2,100	4.0	2,900
4	.....	.....	2.4	830	8.0	14,900	19	3.0	1,440	3.5	2,100	4.0	2,900
5	.....	.....	2.3	740	6.9	10,800	20	2.7	1,110	4.1	3,080	3.7	2,400
6	.....	.....	2.3	740	6.1	8,120	21	2.5	920	7.7	13,700	3.6	2,250
7	.....	.....	5.3	5,760	5.8	7,200	22	2.5	920	7.7	13,700	3.5	2,100
8	.....	.....	6.4	9,080	5.7	6.900	23	2.5	920	9.5	21,700	3.8	2,560
9	.....	.....	5.3	5,760	5.7	6,900	24	2.4	830	6.0	7,800	4.5	3,900
10	.....	.....	6.6	9,760	5.7	6,900	25	2.4	830	5.6	6,600	4.3	3,480
11	2.5	920	6.6	9,760	5.2	5,500	26	2.4	830	5.0	5,000	4.0	2,900
12	2.5	920	5.1	5.240	4.9	4,780	27	2.4	830	4.8	4,560	4.0	2,900
13	2.5	920	4.4	3,680	4.6	4,120	28	2.4	830	5.5	6,320	3.9	2,720
14	2.5	920	4.0	2,900	4.3	3,480	29	2.3	740	6.9	10,800	4.0	2,900
15	2.5	920	3.7	2,400	4.1	3,080	30	2.3	740	6.6	9,760	4.2	3,280
							31	2.3	740	.....	.....	4.0	2,900

NOTE.—Daily discharge determined from a rating curve well defined between 800 and 6,000 second-feet.

Monthly discharge of North Fork of Santiam River at Mehama, Oreg., for 1910.

[Drainage area, 740 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
Oct. 10-31	1,560	740	967	1.31	1.02	40,300	A.
November	21,700	740	5,670	7.66	8.55	337,000	B.
December	17,500	2,100	5,260	7.11	8.20	323,000	B.

SANTIAM RIVER AT JEFFERSON, OREG.

This station, which is located at Jefferson, Oreg., 2½ miles below the junction of the North and South forks, 9 miles above the mouth of the stream and below all tributaries, was established July 19, 1905, and was discontinued July 1, 1906. Readings were begun October 1, 1907, for the United States Weather Bureau; these were made only during the high-water months until 1910. Readings were made beginning May 15, 1908, by the Jefferson Mill Co. for the Geological Survey. Both sets of readings have been reduced to the same datum. The readings for 1910, given herewith, are those made for the Survey.

The Albany and Salem power canals divert water from North Fork near Stayton and South Fork near Lebanon and carry water past this station.

Discharge measurements are made either from the highway bridge or from the Southern Pacific Railroad bridge.

The original staff gage was located on a pier of the railroad bridge, but it was impossible to obtain even approximate gage heights during flood stages. The gage of the Jefferson Mill Co. is at the mill just above the bridge, where accurate gage heights can be obtained. This gage is at the same datum as the old gage. The United States Weather Bureau gage, on the middle pier of the railroad bridge, is also at the same datum.

The records obtained prior to July 1, 1906, are not reliable.

Sufficient data are not at present available for an accurate determination of daily and monthly discharge for 1910.

Discharge measurements of Santiam River at Jefferson, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 19	F. F. Henshaw	190	351	0.50	460
Oct. 13	F. C. Ebert	284	2,420	1.09	1,280

Daily gage height, in feet, of Santiam River at Jefferson, Oreg., for 1910.

[S. A. Pease, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.4	4.9	11.4	3.2	2.4	1.6	1.0	0.6	0.5	0.6	0.6	6.4
2	3.4	5.5	14.5	3.0	2.6	1.6	1.0	.6	.5	.8	.6	5.5
3	2.7	4.1	12.0	3.8	2.4	1.5	1.0	.6	.5	.9	.6	7.4
4	2.6	3.8	9.5	3.5	2.9	1.4	1.0	.5	.....	3.1	.8	8.0
5	2.4	3.6	7.6	3.4	3.3	1.5	.9	.5	.5	2.5	.8	7.0
6	2.4	3.2	7.0	3.5	3.0	1.4	.9	.5	.5	2.4	.7	6.0
7	2.4	3.2	6.0	3.7	2.8	1.4	.8	.....	.5	2.3	1.2	5.4
8	2.8	3.1	5.4	3.8	2.8	1.5	.8	.5	.5	2.2	6.4	5.1
9	2.8	3.0	5.0	3.9	2.8	1.6	.8	.5	.5	1.0	5.4	6.1
10	2.5	3.1	4.6	3.9	2.9	1.7	.....	.5	.5	1.1	6.4	5.4
11	2.5	3.2	4.7	4.1	3.8	1.9	.8	.5	.4	1.0	7.8	5.0
12	2.4	3.8	5.0	4.0	3.6	1.5	.8	.5	.4	1.0	5.0	4.5
13	2.3	6.6	5.6	3.9	3.2	1.6	.8	.5	.4	1.1	3.9	4.0
14	2.3	6.3	5.5	3.7	3.0	1.3	.7	.....	.4	1.1	3.4	3.7
15	2.2	5.4	5.4	3.5	2.8	1.2	.7	.5	.4	1.0	3.0	3.4
16	2.2	4.7	5.2	3.1	2.8	1.2	.7	.5	.4	.9	2.6	3.2
17	2.1	4.9	5.0	3.2	2.6	1.2	.....	.5	.4	.9	2.6	3.9
18	2.1	5.7	4.9	3.4	2.4	1.2	.8	.5	.....	1.6	2.6	3.7
19	4.4	6.0	5.0	3.6	2.3	1.2	.7	.5	.5	1.5	2.7	3.3
20	3.6	6.7	4.8	3.2	2.2	1.1	.7	.5	.5	1.3	2.7	3.0
21	3.2	5.1	4.4	3.5	2.1	1.2	.7	.....	.7	1.1	6.4	3.0
22	4.3	4.8	4.2	3.4	2.0	1.2	.7	.5	.7	1.0	7.0	2.9
23	7.0	4.6	5.1	3.4	2.0	1.4	.7	.5	.7	1.0	8.8	2.7
24	8.0	6.0	4.5	3.6	2.0	1.3	.....	.5	.7	.9	7.0	2.6
25	7.2	8.2	4.0	3.7	2.1	1.2	.7	.5	.7	.8	5.6	3.3
26	5.8	6.6	3.6	3.6	2.1	.....	.7	.5	.7	.7	4.7	3.5
27	5.1	6.7	.....	3.4	1.9	1.2	.6	.5	.7	.7	4.5	3.6
28	6.8	9.0	3.2	3.0	1.7	1.2	.6	.....	.6	.6	5.0	3.3
29	6.6	.....	3.1	3.0	1.8	1.0	.6	.5	.6	.6	7.3	3.2
30	5.6	.....	3.1	2.8	1.6	1.0	.6	.5	.6	.....	7.7	3.1
31	5.0	.....	3.0	.....	1.6	.....	.6	.5	.....	.6	.....	3.2

NOTE.—Gage heights are from readings made for the United States Geological Survey on the Weather Bureau gage except the Sunday readings, which were made for the United States Weather Bureau.

MARION FORK OF SANTIAM RIVER AT MARION LAKE, NEAR HOOVER,[1] OREG.

This station, which is located about 200 feet below the outlet of Marion Lake, 28 miles above Hoover and 30 miles from Detroit, Oreg., from which it is reached by trail, was established February 23, 1907, by J. G. Kelley, of Portland, Oreg., who furnishes the records.

The gage heights for 1907 were obtained by measuring down from a reference point. From January to July, 1909, the gage used recorded maximum and minimum stages between observations. On August 1, 1909, a 15-foot rectangular weir was installed from which the discharge was determined until November 20, 1909, when it was washed away.

On November 24 readings were resumed on the same gage, the controlling point in the channel now being the remnant of the old weir, and were continued until April 30. On January 21, 1910, a broad crested weir, 23 feet long, was completed at the outlet of the lake. The gage at this weir was read until October 12, when the weir was taken out. Readings were resumed October 19 on the lower gage, the same that had been used before the weir was installed, and were continued until the end of the year.

[1] Formerly referred to as "near Detroit, Oreg."

Discharge coefficients for the 23-foot weir were determined by a discharge measurement in October. The rating for the lower gage was defined by comparative readings with the weir gage. The discharge for the 15-foot weir has been computed, making corrections for probable leakage, velocity of approach, and roundness of crest similar to those made for the 23-foot weir. In this manner a record is obtained which is believed to have at least a fair degree of accuracy throughout.

The following measurement was made by F. C. Ebert, by wading above the weir:

October 7, 1910: Width, 30 feet; area, 42 square feet; gage height, 0.88 foot; discharge, 85 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of Marion Fork of Santiam River at Marion Lake, near Hoover, Oreg., for 1909.

[Jack Hamlin, observer.]

Day.	August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.17	70	1.17	70					1.50	183
2									1.50	183
3					1.25	78	1.33	86	1.50	183
4									1.42	168
5									1.42	168
6									1.38	160
7					1.25	78			1.33	151
8									1.33	151
9									1.33	151
10									1.29	144
11									1.25	137
12									1.25	137
13					1.29	82			1.38	160
14							1.31	84	1.50	183
15							1.33	86	1.42	168
16							1.42	95	1.38	160
17					1.29	82	1.42	95	1.33	151
18							2.00	158	1.33	151
19							2.50	221	1.33	151
20					1.31	84	3.00	291	1.29	144
21								530	1.25	137
22								760	1.21	130
23								510	1.21	130
24					1.25	78	2.42	406		125
25			1.21	74			1.75	235		120
26							1.50	183	1.12	114
27					1.25	78	1.50	183	1.12	114
28							1.42	168	1.04	102
29			1.25	78			1.46	175	1.04	102
30							1.42	168	1.02	99
31					1.25	78			1.00	96

NOTE.—Records of gage height and daily discharge Aug. 1 to Nov. 20, 1909, are for the 15-foot weir. Gage read in inches and reduced to feet and hundredths. Discharge determined from a rating curve in which allowance has been made for possible roundness of crest, velocity of approach, and leakage, and which, in view of the uncertainties involved, is only approximate.

Daily means Nov. 21 to 23 estimated by engineer who was on the ground at the time.

Gage heights Nov. 24 to Dec. 31 read on lower gage; discharge for this period determined from a rating curve that is poorly defined.

Daily gage height, in feet, of North Fork of Santiam River at Marion Lake, near Hoover, Oreg., for 1910.

[Jack Hamlin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.96	1.24	1.88	1.24	1.18	1.06	0.90	0.86	0.86	0.86	0.85	1.29
2	.92	1.18	2.32	1.30	1.16	1.06	.90	.86	.86	.88	.88	1.38
3	.92	1.14	2.26	1.42	1.22	1.06	.90	.86	.86	1.40	.88	1.50
4	.92	1.14	2.14	1.38	1.22	1.02	.90	.86	.86	1.38	.88	1.54
5	.90	1.14	2.02	1.28	1.22	1.04	.90	.86	.86	1.24	.88	1.46
6	.90	1.12	1.86	1.26	1.18	1.02	.90	.86	.86	1.10	.88	1.29
7	.90	1.12	1.68	1.22	1.20	1.00	.90	.86	.86	.88	1.00	1.25
8	.90	1.10	1.54	1.22	1.24	1.00	.90	.86	.84	.....	1.05	1.25
9	.90	1.10	1.48	1.22	1.28	.98	.90	.86	.84	.....	1.42	1.25
10	.90	1.10	1.42	1.26	1.52	.96	.90	.86	.84	.....	1.62	1.21
11	.88	1.16	1.40	1.28	1.60	.96	.90	.86	.84	.90	1.83	1.17
12	.88	1.14	1.36	1.32	1.52	.98	.90	.86	.84	.98	1.54	1.12
13	.85	1.22	1.40	1.30	1.38	.96	.90	.86	.86	.....	1.33	1.10
14	.85	1.22	1.46	1.22	1.32	.96	.90	.86	.86	.....	1.25	1.08
15	.83	1.20	1.48	1.18	1.26	.96	.88	.86	.86	.....	1.12	1.04
16	.....	1.20	1.52	1.18	1.18	.98	.88	.86	.86	.....	1.08	1.00
17	.....	1.22	1.46	1.18	1.16	.98	.88	.86	.86	.....	1.08	1.00
18	.....	1.22	1.42	1.24	1.14	.98	.88	.86	.86	.....	1.00	.96
19	.....	1.22	1.48	1.34	1.16	.98	.86	.86	.86	1.00	1.00	.92
20	.....	1.22	1.46	1.42	1.12	.98	.86	.86	.88	.96	1.17	.92
21	.92	1.22	1.42	1.42	1.10	.98	.86	.86	.88	.96	1.33	.92
22	1.04	1.22	1.42	1.38	1.10	1.00	.86	.86	.88	.96	1.46	.92
23	1.32	1.26	1.44	1.42	1.14	1.00	.86	.84	.88	.96	1.71	.90
24	1.52	1.32	1.36	1.48	1.16	.98	.86	.84	.88	.96	1.54	.88
25	1.46	1.32	1.28	1.54	1.20	.96	.86	.84	.86	.96	1.42	.....
26	1.42	1.38	1.22	1.54	1.18	.96	.86	.84	.86	.92	1.33	.....
27	1.36	1.42	1.16	1.40	1.16	.94	.86	.84	.86	.92	1.21	.....
28	1.36	1.52	1.12	1.32	1.12	.94	.86	.84	.86	.92	1.25	.88
29	1.34	.....	1.14	1.24	1.10	.92	.86	.86	.84	.88	1.33	.88
30	1.30	.....	1.16	1.22	1.10	.92	.86	.86	.84	.88	1.33	.88
31	1.26	.....	1.20	.....	1.08	.....	.86	.86	.....	.88	.....	.88

NOTE.—Gage readings Jan. 1 to 15 and Oct. 19 to Dec. 31 made on lower gage; readings Jan. 21 to Oct. 12 made on the gage above the 23-foot broad-crested weir.

Daily discharge, in second-feet, of North Fork of Santiam River at Marion Lake, near Hoover, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	90	135	248	135	126	108	87	82	82	82	76	137
2	85	126	338	145	123	108	87	82	82	84	79	160
3	85	120	326	164	132	108	87	82	82	161	79	183
4	85	120	300	158	132	103	87	82	82	158	79	191
5	82	120	276	142	132	106	87	82	82	135	79	175
6	82	117	244	139	126	103	87	82	82	114	79	144
7	82	117	210	132	129	100	87	82	82	84	96	137
8	82	114	185	132	135	100	87	82	79	84	104	137
9	82	114	175	132	142	97	87	82	79	85	168	137
10	82	114	164	139	182	95	87	82	79	86	207	130
11	79	123	161	142	196	95	87	82	79	87	253	123
12	79	120	155	148	182	97	87	82	79	97	191	114
13	76	132	161	145	158	95	87	82	82	97	151	111
14	76	132	171	132	148	95	87	82	82	97	137	108
15	73	129	175	126	139	95	84	82	82	97	114	102
16	76	129	182	126	126	97	84	82	82	96	108	96
17	78	132	171	126	123	97	84	82	82	96	108	96
18	81	132	164	135	120	97	84	82	82	96	96	90
19	84	132	175	151	123	97	82	82	82	96	96	85
20	88	132	171	164	117	97	82	82	84	90	123	85

Daily discharge, in second-feet, of North Fork of Santiam River at Marion Lake, near Hoover, Oreg., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	90	132	164	164	114	97	82	82	84	90	151	85
22	106	132	164	158	114	100	82	82	84	90	175	85
23	148	139	168	164	120	100	82	79	84	90	226	82
24	182	148	155	175	123	97	82	79	84	90	191	79
25	171	148	142	185	129	95	82	79	82	90	168	79
26	164	158	132	185	126	95	82	79	82	85	151	79
27	155	164	123	161	123	92	82	79	82	85	130	79
28	155	182	117	148	117	92	82	79	82	85	137	79
29	151	.....	120	135	114	90	82	82	79	79	151	79
30	145	.....	123	132	114	90	82	82	79	79	151	79
31	139	.....	129	.....	111	.....	82	82	.....	79	.....	79

NOTE.—Daily discharge for the records on the lower gage, Jan. 1 to 15 and Oct. 19 to Dec. 31, computed from a rating curve derived from the curve for the weir and comparative readings on the lower and weir gages; the curve is fairly well defined for the end of the year, but only poorly defined for January.

Discharge over the 23-foot weir computed from a rating curve based on one discharge measurement and the weir formula, allowing for velocity of approach and assuming leakage of 10 second-feet through the weir; curve well defined below 100 second-feet and fairly well defined for higher stages.

The water level of the lake was raised Jan. 16 to 20, when the upper weir was built, and lowered Oct. 13 to 18, after it was torn out. Discharge for these periods determined by interpolation; the figures show the natural discharge during the time and not the actual discharge, which would be less in the earlier and greater in the later period.

Monthly discharge of Marion Fork of Santiam River at Marion Lake, near Hoover, Oreg., for 1909–10.

[Drainage area, 26 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1909.							
August	.....	.....	70.0	2.69	3.10	4,300	B.
September	.....	.....	72.8	2.80	3.12	4,330	B.
October	.....	.....	80.0	3.08	3.55	4,920	B.
November	760	.....	182	7.00	7.81	10,800	C.
December	183	96	144	5.54	6.39	8,850	C.
1910.							
January	182	73	104	4.00	4.61	6,400	C.
February	182	114	132	5.08	5.29	7,330	B.
March	338	117	184	7.08	8.16	11,300	B.
April	185	126	147	5.65	6.30	8,750	B.
May	196	111	132	5.08	5.86	8,120	B.
June	108	90	97.9	3.77	4.21	5,830	A.
July	87	82	84.5	3.25	3.75	5,200	A.
August	82	79	81.4	3.13	3.61	5,010	A.
September	84	79	81.6	3.14	3.50	4,860	A.
October	161	79	95.6	3.68	4.24	5,880	A.
November	253	76	135	5.19	5.79	8,030	B.
December	191	79	110	4.23	4.88	6,760	B.
The year	338	73	115	4.42	60.20	83,470	

NORTH FORK OF PUZZLE CREEK NEAR HOOVER, OREG.

This station, which is located above the junction of the North and South forks of Puzzle Creek near Hoover, Oreg., was established August 6, 1909.

A 6-foot rectangular weir was constructed and was used to determine the discharge until the flood of November, 1909, when it was washed out. During 1910 gage readings were continued on the gage

above the remains of the old weir. Sufficient measurements have not yet been made to make it possible to compute daily discharge.

The discharge at this station has been added to that of the South Fork to determine the total flow of the creek at the level of the proposed diversion canal from Marion Lake, but the result is not comparable with the results obtained at the station established on the mouth of the creek in February, 1907, because of the intermediate drainage.

The following discharge measurement was made by F. C. Ebert:

October 7, 1910: Width, 18 feet; area, 17.2 square feet; gage height, 0.86 feet; discharge, 9.3 second-feet.

Daily gage height, in feet, of North Fork of Puzzle Creek near Hoover, Oreg., for 1910.

[Jack Hamlin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.85	0.86	0.98	0.88	1.12	1.00	0.88	0.88	0.86	0.86	0.80	0.88
2	.85	.86	1.22	.88	1.04	1.00	.88	.88	.86	.86	.80	.88
3	.85	.86	1.20	.88	.98	.98	.88	.88	.86	.84	.80	1.04
4	.85	.84	1.20	.88	.98	.98	.86	.88	.86	.84	.80	1.00
5	.85	.84	1.20	.88	.98	1.00	.86	.88	.86	.84	.80	.96
6	.82	.84	1.10	.88	.98	1.02	.86	.88	.86	.84	.80	.90
7	.82	.84	1.08	.86	1.04	1.02	.86	.88	.86	.86	.84	.88
8	.82	.84	.96	.86	1.12	1.00	.88	.88	.86	.....	.92	.88
9	.82	.84	.96	.86	1.20	.98	.88	.88	.84	.....	1.18	.88
10	.82	.84	.96	.94	1.28	1.06	.88	.88	.84	.....	1.44	.86
11	.82	.82	.96	.98	1.34	1.14	.88	.88	.84	.....	1.04	.86
12	.82	.82	.96	.98	1.28	1.08	.88	.88	.84	.86	.86	.86
13	.82	.82	.94	.96	1.20	.94	.88	.88	.84	.84	.86	.86
14	.82	.82	.98	.96	1.12	.92	.88	.88	.84	.82	.84	.86
15	.82	.82	1.12	.96	1.06	.92	.88	.88	.84	.82	.84	.86
16	.80	.82	1.10	.96	1.04	.92	.88	.88	.84	.82	.82	.84
17	.80	.82	1.10	.96	1.00	.90	.88	.86	.84	.82	.82	.84
18	.80	.82	1.08	.96	.98	.90	.88	.86	.84	.82	.82	.84
19	.80	.82	1.06	1.12	.98	.90	.88	.86	.84	.80	.82	.84
20	.80	.82	1.08	1.12	1.04	.90	.88	.86	.84	.80	.90	.84
21	.80	.82	1.08	1.00	1.10	.90	.88	.86	.84	.80	1.00	.84
22	.88	.82	1.08	.98	1.14	.92	.88	.86	.84	.80	1.06	.84
23	.98	.82	1.08	1.18	1.20	.94	.88	.86	.84	.82	1.00	.84
24	.98	.86	1.04	1.28	1.24	.94	.88	.86	.84	.80	.94	.84
25	.96	.86	1.04	1.32	1.18	.90	.88	.86	.84	.80	.92	.....
26	.90	.86	.98	1.32	1.18	.90	.88	.86	.84	.80	.92	.....
27	.90	.86	.90	1.32	1.10	.90	.88	.86	.82	.80	.90	.....
28	.90	.98	.88	1.28	.98	.90	.88	.86	.82	.80	.90	.....
29	.86	.....	.88	1.22	.96	.90	.88	.86	.82	.80	.90	.84
30	.86	.....	.88	1.18	1.00	.88	.88	.86	.82	.80	.88	.84
31	.86	.....	.88	.....	1.00	.....	.88	.86	.....	.....	.....	.84

SOUTH FORK OF PUZZLE CREEK NEAR HOOVER, OREG.

This station, which is located above the junction of the North and South forks of Puzzle Creek near Hoover, Oreg., was established August 6, 1909.

A 6-foot rectangular weir was constructed and was used to determine the discharge until the flood of November, 1909, when it was washed out. During 1910 gage readings were constructed on the gage above the remains of the old weir. Sufficient measurements have not yet been made to make it possible to compute daily discharge.

The discharge at this station has been added to that of the North Fork to determine the total flow of the creek at this level, but the result is not comparable with the results obtained at the station established on the mouth of the creek in February, 1907, because of the intermediate drainage.

The following discharge measurements was made by F. C. Ebert:

October 7, 1910: Width, 15 feet; area, 12.4 square feet; gage height, 0.88 foot; discharge, 16.2 second-feet.

Daily gage height, in feet, of South Fork of Puzzle Creek near Hoover, Oreg., for 1910.

[Jack Hamlin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.92	0.92	0.96	0.90	0.96	1.14	1.14	1.12	1.02	0.94	0.80	0.86
2	.92	.92	1.40	.90	.94	1.14	1.14	1.12	1.00	.96	.80	.86
3	.92	.90	1.22	.90	.96	1.14	1.12	1.10	1.00	.96	.80	.92
4	.92	.90	1.10	.90	.96	1.12	1.10	1.10	1.00	.96	.80	.90
5	.92	.88	.92	.90	.96	1.16	1.08	1.10	1.00	.94	.80	.88
6	.92	.88	.92	.90	.98	1.18	1.08	1.10	1.00	.92	.80	.86
7	.92	.86	.92	.88	1.02	1.16	1.12	1.10	.98	.88	.84	.86
8	.92	.84	.86	.88	1.04	1.14	1.16	1.08	.98	.....	.92	.86
9	.92	.84	.82	.88	1.08	1.12	1.14	1.08	.98	.....	1.18	.84
10	.92	.84	.82	.90	1.12	1.14	1.14	1.08	.98	.....	1.44	.84
11	.92	.84	.82	.90	1.16	1.20	1.16	1.08	.98	.....	1.04	.84
12	.92	.84	.84	.90	1.12	1.16	1.18	1.08	.98	.92	.86	.82
13	.92	.84	.82	.86	1.08	1.12	1.20	1.08	.96	.88	.84	.82
14	.92	.84	.82	.86	1.06	1.14	1.20	1.08	.96	.88	.84	.82
15	.92	.84	.94	.86	1.02	1.16	1.18	1.08	.96	.88	.84	.82
16	.92	.84	.94	.86	1.00	1.16	1.18	1.08	.96	.86	.80	.82
17	.92	.84	.94	.86	.98	1.16	1.16	1.06	.96	.84	.80	.82
18	.92	.84	.94	.86	.96	1.16	1.16	1.06	.96	.84	.80	.82
19	.92	.82	.94	.96	.96	1.20	1.16	1.06	.96	.84	.80	.82
20	.92	.82	.94	.96	.98	1.22	1.14	1.04	.96	.82	.86	.82
21	.92	.82	.94	.92	1.06	1.20	1.14	1.04	.96	.82	.96	.82
22	.96	.82	.94	.90	1.10	1.20	1.14	1.04	.96	.82	.98	.82
23	1.00	.82	.94	1.02	1.18	1.18	1.14	1.02	.96	.82	.98	.82
24	.98	.86	.92	1.04	1.18	1.18	1.14	1.02	.96	.80	.90	.82
25	.96	.86	.92	1.04	1.14	1.18	1.12	1.02	.94	.80	.90	.....
26	.94	.86	.92	1.04	1.14	1.16	1.12	1.02	.94	.80	.88	.....
27	.92	.86	.92	1.00	1.12	1.18	1.12	1.02	.94	.80	.84	.....
28	.92	.96	.90	.98	1.10	1.18	1.12	1.02	.92	.80	.86	.....
29	.92	.....	.90	.96	1.14	1.16	1.12	1.02	.92	.80	.86	.82
30	.92	.....	.90	.94	1.14	1.16	1.12	1.02	.92	.80	.86	.82
31	.92	.....	.90	.....	1.14	.....	1.12	1.02	.....	.80	.....	.82

BREITENBUSH CREEK NEAR DETROIT, OREG.

This station, which is located about 2 miles above the mouth of Breitenbush Creek, 1½ miles from Detroit by trail, and just below the mouth of French Creek, was established October 10, 1910, in cooperation with the United States Forest Service.

Tumble Creek, a small stream, enters between the gage and the mouth.

Discharge measurements are now (1911) made from a cable and car, but the first one was made from a foot log near the staff gage.

The gage readings are only fragmentary, but are sufficient, when taken together with the records on the North Fork of Santiam River above and below, to give a fairly good idea of the regimen of the stream.

The following measurement was made by F. C. Ebert from a foot log:

October 10, 1910: Width, 56 feet; area, 138 square feet; gage height, 2.02 feet; discharge, 193 second-feet.

Daily gage height, in feet, of Breitenbush Creek near Detroit, Oreg., for 1910.

[E. W. Gribble, observer.]

Day.	Oct	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct	Nov.	Dec.
1		1.9		11				21			
2				12		3.4		22		4.4	
3			5.2	13				23			2.6
4				14			3.1	24			
5		1.9		15				25	1.9	3.7	
6			4.0	16			2.9	26			2.8
7				17				27			
8		3.8		18		2.5		28			
9				19				29			
10		4.7	3.7	20			2.7	30		4.3	
								31			

SOUTH FORK OF SANTIAM RIVER NEAR CASCADIA, OREG.

This station, which is located at the Cascadia ranger station, 3 miles above Cascadia, Oreg., in sec. 34, T. 13 S., R. 3 E., above the mouth of the Middle Fork of Santiam River, was established August 3, 1910, in cooperation with the Forest Service.

Measurements are made from a cable or, at low water, by wading.

The staff gage is permanently set and its datum has remained unchanged.

The following measurement was made by B. F. Heintzleman:

August 3, 1910: Width, 60 feet; area, 108 square feet; gage height, 1.63 feet; discharge, 32.7 second-feet.

Daily gage height, in feet, of South Fork of Santiam River near Cascadia, Oreg., for 1910.

[A. O. Knowles, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.65			5.40	16				2.50	4.15
2				1.69	4.92	17			1.98	2.38	4.00
3	1.63				3.80	18			1.91		3.80
4				1.80		19					3.80
5					3.40	20			1.85	5.60	4.00
6					3.70	21			1.85		4.20
7					4.20	22					4.00
8					4.60	23				3.80	3.80
9					4.40	24					3.60
10					4.50	25		1.62	1.75	3.00	3.60
11					4.40	26					3.60
12					4.40	27					3.80
13			2.15		4.37	28			1.71	8.50	3.70
14					4.35	29					3.50
15			2.00	2.85	4.20	30				7.20	3.40
						31					3.40

SOUTH FORK OF SANTIAM RIVER AT WATERLOO, OREG.

This station, which is located one-half mile below the highway bridge at Waterloo, Oreg., about 4 miles above the mouth of Hamilton Creek, and 3 miles above the dam, by means of which water is diverted into a power canal for use in the town of Albany, was established July 28, 1905, discontinued March 31, 1907, and reestablished October 3, 1910.

Discharge measurements at present are made by wading during low water, the high water measuring equipment not having been replaced since it was washed out in the flood of November, 1906. The present gage datum is the same as that used when the station was originally maintained. The measurement made during 1910 indicated no change in control since 1906, and it is probable that no equipment for high-water measurements will be necessary.

The following discharge measurement was made by B. F. Heintzleman:

October 24, 1910: Width, 167 feet; area, 308 square feet; gage height, 0.92 foot; discharge, 293 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of South Fork of Santiam River at Waterloo, Oreg., for 1910.

[P. D. McCarty, observer.]

Day.	October.		November.		December.		Day.	October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	0.6	158	5.4	8,580	16	.6	158	2.0	1,190	2.5	1,870
2	.....	.....	.6	158	4.9	7,120	17	2.0	1,190	1.8	960	2.4	1,730
3	1.8	960	.7	192	8.2	17,700	18	1.3	500	1.9	1,070	3.0	2,680
4	2.3	1,590	.9	273	7.3	14,700	19	1.1	370	1.3	500	2.7	2,180
5	2.0	1,190	.9	273	6.0	10,400	20	1.0	320	2.3	1,590	2.5	1,870
6	1.7	850	.8	230	5.0	7,400	21	.9	273	5.6	9,190	2.4	1,730
7	1.2	430	1.4	580	4.1	5,010	22	.8	230	6.3	11,400	2.3	1,590
8	.9	273	6.3	11,400	4.0	4,760	23	1.0	320	10.4	25,300	2.4	1,730
9	.8	230	4.2	5,260	4.9	7,120	24	.9	273	6.0	10,400	3.4	3,440
10	.7	192	4.9	7,120	4.4	5,780	25	.8	230	4.4	5,780	3.3	3,240
11	.6	158	5.6	9,190	3.6	3,850	26	.8	230	3.7	4,070	3.0	2,680
12	.6	158	3.8	4,290	3.4	3,440	27	.8	230	3.4	3,440	2.9	2,510
13	1.0	320	2.9	2,510	3.2	3,050	28	.7	192	6.2	11,100	2.7	2,180
14	.8	230	2.5	1,870	3.0	2,680	29	.7	192	8.3	18,000	2.6	2,020
15	.6	158	2.2	1,450	2.7	2,180	30	.7	192	7.2	14,400	2.8	2,340
							31	.7	192	.....	.....	3.0	2,680

NOTE.—Daily discharge determined from a rating curve well defined between 250 and 5,000 second-feet.

Monthly discharge of South Fork of Santiam River at Waterloo, Oreg., for 1910.

[Drainage area, 640 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
October (29 days)	1,590	158	408	0.638	0.69	23,500	A.
November	25,300	158	5,440	8.50	9.48	324,000	B.
December	17,700	1,590	4,520	7.06	8.14	278,000	B.

LUCKIAMUTE RIVER BASIN.

Luckiamute River rises on the eastern slope of the Coast Range in Polk County and flows southeastward to its junction with Willamette River, which it enters opposite the mouth of the Santiam. It is subject to excessive and violent floods due to the sudden melting of snows on the mountain slopes.

LUCKIAMUTE RIVER NEAR SUVER, OREG.

This gaging station, which is located in a comparatively deep canyon just below Helmick bridge on the public highway, 4 miles northwest of Suver, Oreg., 4 miles south of Monmouth, and 3 miles below the junction of the North and South forks, was established August 18, 1905.

The staff gage is in two sections. The lower section is an inclined rod drift-bolted to a bridge post; the upper portion is vertical and is nailed to a bridge timber.

Discharge measurements are made from a cable.

The records are believed to be reliable.

The following measurement was made by Henshaw and Davenport by wading.

August 3, 1910: Width, 52 feet; area, 70 feet; gage height, 1.11 feet; discharge, 45 second-feet.

Daily gage height, in feet, of Luckiamute River near Suver, Oreg., for 1910.

[Mrs. P. C. Bush, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.5	15.0	25.5	6.45	3.9	2.4	1.85	1.35	0.95	1.15	1.95	14.0
2	6.5	13.6	26.25	6.9	4.0	2.5	1.85	1.3	.85	1.2	1.95	15.1
3	6.0	11.5	25.6	7.2	4.1	2.5	1.85	1.25	.85	5.2	1.75	15.5
4	6.4	11.0	24.3	7.05	4.15	2.5	1.75	1.15	.85	6.7	2.15	15.8
5	7.2	10.4	23.0	6.9	3.9	2.35	1.75	1.15	.85	6.4	2.9	16.0
6	7.6	9.5	20.6	6.55	3.85	2.35	1.75	1.15	.85	5.9	4.7	15.8
7	8.35	8.2	19.0	6.3	3.5	2.35	1.7	1.15	.85	5.6	4.75	15.5
8	8.9	7.7	16.2	5.9	3.4	2.2	1.7	1.2	.95	5.4	5.9	14.0
9	9.6	7.65	14.0	10.0	3.35	2.05	1.65	1.15	.95	4.9	7.6	13.7
10	9.0	7.5	11.5	9.95	3.35	2.05	1.55	1.15	.95	3.8	21.7	13.0
11	8.7	7.4	9.7	9.5	3.4	2.05	1.55	1.15	.95	2.4	22.0	11.6
12	8.5	6.9	9.0	8.0	3.3	2.05	1.55	1.2	.95	2.4	19.0	10.8
13	7.9	11.8	8.6	8.7	3.3	2.05	1.5	1.15	.95	2.35	16.0	9.5
14	7.7	14.0	8.55	7.75	3.3	2.05	1.45	1.1	.95	2.2	7.9	8.9
15	6.9	12.5	7.9	7.5	3.3	2.05	1.45	1.1	.95	2.2	7.4	8.35
16	11.0	12.0	7.5	6.8	3.25	2.05	1.45	1.1	.95	2.2	6.0	7.7
17	14.5	11.7	6.9	6.65	3.2	2.05	1.4	1.1	1.45	2.9	6.15	7.3
18	14.4	11.6	6.9	6.5	3.2	2.05	1.4	1.0	1.45	3.1	6.3	7.1
19	14.3	11.0	6.85	6.2	3.1	2.05	1.35	1.0	1.65	3.35	8.6	6.95
20	14.0	13.0	6.75	6.05	2.9	2.05	1.35	1.0	1.8	3.5	12.0	6.9
21	14.7	14.0	6.5	5.9	2.9	1.95	1.25	1.0	1.85	3.8	20.0	6.7
22	20.0	14.9	6.25	5.8	2.9	1.95	1.25	1.05	1.95	3.9	23.0	6.8
23	19.0	16.5	5.9	5.65	2.9	1.95	1.25	1.05	1.95	3.7	22.0	7.1
24	19.4	22.5	5.8	5.2	2.9	1.95	1.35	1.05	1.45	3.4	19.0	8.5
25	18.0	24.0	5.4	4.9	2.8	1.95	1.35	1.05	.95	2.9	17.5	7.9
26	17.8	22.5	5.35	4.4	2.75	1.95	1.35	1.05	1.15	2.6	16.4	7.8
27	17.0	24.0	5.2	4.15	2.7	1.85	1.35	1.05	1.15	2.25	15.0	7.85
28	16.0	25.7	4.9	4.1	2.65	1.85	1.35	.95	1.15	2.15	12.7	8.5
29	16.3	.....	4.65	3.9	2.5	1.85	1.35	.95	1.15	1.95	13.0	8.9
30	16.5	.....	4.4	3.9	2.5	1.85	1.35	.95	1.15	1.95	13.8	9.3
31	16.0	.....	4.15	.....	2.5	.....	1.35	.95	.....	2.0	.....	10.0

Daily discharge, in second-feet, of Luckiamute River near Suver, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	732	2,780	7,000	724	332	153	103	66	42	53	111	2,480
2	732	2,360	7,380	802	345	163	103	62	36	56	111	2,810
3	645	1,800	7,050	860	358	163	103	59	36	515	95	2,930
4	715	1,680	6,390	830	364	163	95	53	36	768	128	3,020
5	860	1,540	5,770	802	332	148	95	53	36	715	206	3,080
6	940	1,330	4,740	741	326	148	95	53	36	628	440	3,020
7	1,090	1,060	4,110	698	280	148	91	53	36	575	448	2,930
8	1,200	960	3,150	628	267	133	91	56	42	545	628	2,480
9	1,350	950	2,480	1,440	260	120	87	53	42	470	940	2,390
10	1,220	920	1,800	1,430	260	120	80	53	42	319	5,190	2,200
11	1,160	900	1,380	1,330	267	120	80	53	42	153	5,320	1,830
12	1,120	802	1,220	1,020	254	120	80	56	42	153	4,110	1,630
13	1,000	1,880	1,140	1,160	254	120	76	53	42	148	3,080	1,330
14	960	2,480	1,130	970	254	120	72	50	42	133	1,000	1,200
15	802	2,060	1,000	920	254	120	72	50	42	133	900	1,090
16	1,680	1,930	920	785	248	120	72	50	42	133	645	960
17	2,620	1,860	802	759	242	120	69	50	72	206	671	880
18	2,600	1,830	802	732	242	120	69	44	72	230	698	840
19	2,560	1,680	794	680	230	120	66	44	87	260	1,140	811
20	2,480	2,200	777	654	206	120	66	44	99	280	1,930	802
21	2,680	2,480	732	628	206	111	59	44	103	319	4,490	768
22	4,490	2,740	688	610	206	111	59	47	111	332	5,770	785
23	4,110	3,250	628	584	206	111	59	47	111	306	5,320	840
24	4,260	5,540	610	515	206	111	66	47	72	267	4,110	1,120
25	3,750	6,240	545	470	195	111	66	47	42	206	3,580	1,000
26	3,680	5,540	538	397	190	111	66	47	53	173	3,220	980
27	3,410	6,240	515	364	184	103	66	47	53	138	2,780	990
28	3,080	7,100	470	358	170	103	66	42	53	128	2,120	1,120
29	3,180	.....	432	332	163	103	66	42	53	111	2,200	1,200
30	3,250	.....	397	332	163	103	66	42	53	111	2,420	1,290
31	3,080	.....	364	.....	163	.....	66	42	.....	115	.....	1,440

NOTE.—Daily discharge determined from a rating curve well defined between 60 and 4,500 second-feet.

Monthly discharge of Luckiamute River near Suver, Oreg., for 1910.

[Drainage area, 233 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	4,490	645	2,110	9.06	10.44	130,000	A.
February	7,100	802	2,580	11.1	11.56	143,000	A.
March	7,380	364	2,120	9.10	10.49	130,000	A.
April	1,440	332	752	3.23	3.60	44,700	A.
May	364	163	246	1.06	1.22	15,100	A.
June	163	103	125	.536	.60	7,440	A.
July	103	59	76.5	.328	.38	4,700	B.
August	66	42	50.0	.215	.25	3,070	B.
September	111	36	55.7	.239	.27	3,310	B.
October	768	53	280	1.20	1.38	17,200	A.
November	5,770	95	2,130	9.14	10.20	127,000	A.
December	3,080	768	1,620	6.95	8.01	99,600	A.
The year	7,380	36	1,000	4.29	58.40	725,000	

YAMHILL RIVER BASIN.

Yamhill River drains an area on the east side of the Coast Range north of that drained by the Luckiamute. The run-off from the slope of the Coast Range is high and the rivers are subject to violent floods.

SOUTH FORK OF YAMHILL RIVER AT SHERIDAN, OREG.

This gaging station, which is located at the highway bridge in Sheridan, Oreg., 2 miles below the mouth of Mill Creek, was established April 25, 1906, discontinued (for lack of an observer) June 30, 1909, and reestablished August 3, 1910.

The staff gage was torn out September 11, 1910, during the reconstruction of the bridge, and a new chain gage installed at the same datum December 9.

Discharge measurements are made from the highway bridge. The records are believed to be fairly reliable, although the conditions are not ideal. The banks of the river are densely covered with willows and brush that render the accurate determination of flood discharge difficult.

Discharge measurements of South Fork of Yamhill River at Sheridan, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 3*a*	Henshaw and Davenport	40	39	0.06	48
Oct. 15*b*	F. C. Ebert	75	66	.52	134

a Waded above bridge. *b* Waded below bridge.

Daily gage height, in feet, and discharge, in second-feet, of South Fork of Yamhill River at Sheridan, Oreg., for 1910.

[J. L. Morris, observer.]

Day.	August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			0.05	48						
2			.05	48						
3			.05	48						
4			.05	48						
5			.05	48						
6			.05	48						
7	0.05	48	.05	48						
8	.05	48	.05	48						
9	.05	48	.05	48					5.4	2,820
10	.05	48	.05	48					5.1	2,560
11	.05	48							4.3	1,890
12	.05	48							3.9	1,580
13	.05	48							3.5	1,300
14	.05	48							3.2	1,100
15	.05	48							3.0	980

Daily gage height, in feet, and discharge, in second-feet, of South Fork of Yamhill River at Sheridan, Oreg., for 1910—Continued.

Day.	August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Dis. charge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
16	.05	48							2.6	775
17	.05	48							2.4	686
18	.05	48							2.4	686
19	.05	48							2.3	644
20	.05	48							2.1	563
21	.05	48							2.5	730
22	.05	48							4.4	1,970
23	.05	48							4.0	1,660
24	.05	48							3.6	1,370
25	.05	48							3.8	1,510
26	.05	48							3.3	1,160
27	.05	48							3.2	1,100
28	.05	48							4.3	1,890
29	.05	48							4.0	1,660
30	.05	48							3.6	1,370
31	.05	48							4.8	2,300

NOTE.—Daily discharge determined from well-defined rating curve.

YAMHILL RIVER AT LA FAYETTE, OREG.

This station, which is located at the county highway bridge at La Fayette, Oreg., three-fourths mile above the locks and about 1½ miles below the junction of the North and South forks, was established October 6, 1908, for the purpose of developing a rating curve to be applied to old records of gage height obtained at the locks by the United States Army engineers.

The vertical staff gage is in two sections attached to the north abutment of the highway bridge from which discharge measurements are made.

There are two gages at the locks, one above and one below the dam; only the latter is an index of discharge; the former and also the Survey gage are affected by the accumulation of drift on the dam and the infrequent lockages. These readings are therefore published, as well as those on the Survey gage, for purposes of comparison.

The data obtained are insufficient for a determination of discharge.

Discharge measurements of Yamhill River at La Fayette, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.		Discharge.
				Bridge.	Below locks.	
		Feet.	*Sq. ft.*	*Feet.*	*Feet.*	*Sec.-ft.*
Aug. 2[a]	Henshaw and Davenport	45	60	1.24	3.08	60
Oct. 16[b]	F. C. Ebert	89	193	1.80	3.95	258

[a] Measured by wading below the locks. [b] Measured from boat below locks.

Daily gage height, in feet, of Yamhill River at La Fayette, Oreg., for 1910.

[United States Geological Survey gage at bridge. H. W. Koch, observer.]

Day.	Jan.	Feb.	Mar.	Apr,	May.	June.	July.	Aug.	Sept.	Oct.
1	4.4	6.8	16.0	3.0	2.8	1.9	1.6	1.2	1.3	1.3
2	3.9	6.3	17.18	2.5	2.8	1.9	1.6	1.2	1.3	1.4
3	3.4	5.8	18.85	3.9	2.8	1.8	1.6	1.2	1.3	1.7
4	3.2	4.8	19.45	3.8	2.9	1.8	1.6	1.2	1.3	3.1
5	3.0	4.8	16.65	3.6	2.8	1.8	1.6	1.25	1.3	2.3
6	2.9	4.5	10.2	3.2	2.8	1.8	1.6	1.3	1.3	2.1
7	3.3	4.3	7.1	3.0	2.65	1.8	1.6	1.25	1.3	1.7
8	4.3	4.0	6.1	4.7	2.6	1.75	1.55	1.2	1.3	1.4
9	5.0	3.8	5.2	6.3	2.5	1.75	1.55	1.25	1.3	1.9
10	4.9	3.9	4.8	5.1	2.5	1.7	1.5	1.3	1.3	1.9
11	4.8	4.3	4.6	5.5	2.5	1.7	1.45	1.3	1.3	1.8
12	4.3	4.5	4.5	5.65	2.5	1.85	1.45	1.3	1.3	1.7
13	4.0	5.5	4.3	5.5	2.4	1.85	1.4	1.3	1.3	1.8
14	4.0	7.0	4.15	4.3	2.4	1.8	1.4	1.3	1.3	1.7
15	4.0	6.8	4.0	4.1	2.3	1.8	1.4	1.35	1.3	1.7
16	3.7	6.2	3.8	3.9	2.3	1.7	1.35	1.3	1.4	1.8
17	4.4	6.2	3.6	3.6	2.2	1.7	1.4	1.35	1.4	1.75
18	7.0	5.6	3.5	3.3	2.2	1.7	1.4	1.3	1.4	2.0
19	8.9	6.8	3.5	3.3	2.1	1.7	1.4	1.3	1.5	2.3
20	8.1	5.7	3.4	3.2	2.1	1.7	1.4	1.4	1.5	2.1
21	7.4	6.5	3.7	3.1	2.2	1.7	1.4	1.3	1.45	2.0
22	7.7	6.2	3.5	3.0	2.1	1.8	1.3	1.35	1.4	1.9
23	8.1	6.5	3.4	2.85	2.1	1.8	1.6	1.3	1.4	1.9
24	10.7	8.35	3.3	2.9	2.1	1.8	1.5	1.3	1.35	1.75
25	10.5	11.0	3.2	2.7	2.1	1.7	1.5	1.3	1.35	1.7
26	10.1	13.25	3.2	2.6	2.1	1.65	1.35	1.15	1.4	1.7
27	8.5	15.0	3.2	2.5	2.0	1.6	1.35	1.05	1.35	1.7
28	8.0	15.1	3.0	2.4	2.0	1.6	1.35	1.2	1.3	1.7
29	7.6	.....	3.0	2.35	2.0	1.6	1.3	1.2	1.25	1.6
30	6.9	.....	2.9	2.4	2.0	1.6	1.3	1.2	1.3	1.6
31	7.1	.....	2.8	.....	2.0	.....	1.25	1.3	.....	1.6

[Lower gage at locks. United States Engineer Corps, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12.2	20.7	34.7	8.7	7.9	5.4	4.2	3.1	2.8	2.8	3.4	27.5
2	11.8	18.3	36.5	8.7	8.0	5.2	4.2	3.1	2.9	2.9	3.4	28.0
3	11.0	17.0	37.9	11.1	7.8	5.1	4.1	3.1	2.8	3.5	3.5	26.0
4	10.9	14.7	38.7	11.5	8.0	5.0	4.1	3.1	2.8	8.2	3.5	27.5
5	9.2	13.8	35.3	11.0	8.6	4.9	4.0	3.1	2.8	7.9	3.5	28.2
6	9.1	13.2	30.0	10.4	8.7	4.8	4.0	3.1	2.8	7.5	3.5	26.9
7	9.7	12.7	24.5	10.4	8.2	4.8	3.9	3.1	2.8	6.3	3.7	23.2
8	11.0	12.1	21.0	12.8	8.0	4.8	3.9	3.0	2.8	4.6	8.9	20.2
9	13.0	11.7	18.0	15.8	7.8	4.7	3.8	3.0	2.8	4.5	11.5	19.7
10	12.6	11.4	16.6	13.6	7.8	4.6	3.8	3.0	2.8	4.3	17.7	18.9
11	12.1	12.3	15.5	14.3	8.4	4.8	3.7	3.0	2.8	4.0	25.8	17.9
12	11.6	12.6	15.0	14.8	10.0	4.9	3.6	3.0	2.8	3.9	22.3	16.2
13	11.0	14.9	14.8	13.6	9.6	5.2	3.6	3.0	2.8	3.8	16.2	14.6
14	10.9	19.6	14.8	12.7	9.0	5.0	3.5	3.0	2.8	3.8	12.4	13.5
15	10.8	20.0	14.8	12.1	8.4	4.8	3.5	2.9	2.8	3.8	9.9	12.5
16	10.6	21.1	14.4	11.5	7.9	4.7	3.5	2.9	3.0	3.9	8.9	11.7
17	11.3	17.9	13.9	10.8	7.3	4.6	3.5	3.0	3.0	3.8	9.3	12.6
18	19.3	16.2	13.4	10.3	7.1	4.5	3.5	3.0	3.0	4.2	7.8	12.5
19	23.8	18.8	13.0	10.0	6.9	4.5	3.5	2.9	3.2	5.0	8.0	13.0
20	22.0	18.6	13.2	10.0	6.8	4.5	3.5	2.9	3.1	4.8	11.3	12.1
21	19.8	20.0	12.8	10.0	6.5	4.5	3.4	2.9	3.0	4.6	26.6	11.3
22	20.6	19.2	12.0	9.8	6.4	4.6	3.4	2.9	3.1	4.3	29.1	10.9
23	23.2	19.1	11.9	9.6	6.4	4.8	3.7	2.9	3.2	4.0	30.1	10.4
24	28.6	24.0	12.9	9.4	6.3	4.8	3.6	2.9	3.1	3.8	29.1	12.4
25	28.7	29.4	12.4	9.3	6.0	4.7	3.5	2.8	3.1	3.7	26.2	11.7
26	28.2	32.1	11.7	9.3	6.0	4.5	3.4	2.8	2.9	3.7	19.8	12.9
27	25.3	33.4	10.8	9.1	6.0	4.4	3.3	2.7	2.9	3.6	16.8	12.5
28	23.2	33.5	10.2	8.8	6.0	4.3	3.3	2.8	2.9	3.5	16.5	12.0
29	23.6	.....	9.8	8.2	5.9	4.3	3.2	2.8	2.9	3.4	19.8	11.6
30	22.4	.....	9.2	7.8	5.8	4.2	3.1	2.8	2.8	3.4	25.3	12.6
31	21.6	.....	8.8	.....	5.6	.....	3.1	2.8	.....	3.4	.....	14.8

CLACKAMAS RIVER BASIN.

CLACKAMAS RIVER NEAR CAZADERO, OREG.

This station, which is located at the second dam site of the Clackamas River project of the Portland Railway, Light & Power Co., where it is proposed to erect a dam for the development of water power to be operated in conjunction with the plant at Cazadero, 2 miles below, was established January 1, 1909, by the company, which cooperates with the Geological Survey in its maintenance. It is above all backwater from the dam.

The gage is a vertical staff graduated to feet and tenths, and reads sea-level elevations (Portland Railway, Light & Power Co. datum).

Measurements are made from a standard cable and car 50 feet below the gage. The gaging section is a comparatively quiet pool just above a riffle and below a rather narrow box canyon. Conditions are not favorable for discharge measurements at high water but are favorable for good results at medium and low stages. Both banks of the stream are high and rocky. The bed is composed of gravel and cobblestones.

Daily gage readings are also made at the company's dam, 2 miles downstream. The dam, as first constructed, had a triangular crest, downstream slope 2½:1 and upstream slope 6:1. It was reconstructed in 1909 and is now of ogee cross section, constructed of timber, with an upstream slope of 2½:1. The crest is at an elevation of 521.25 feet and is 170 feet in length and about 40 feet above the apron. The abutments of the dam extend upstream 53 feet from the crest. In the left abutment are the gates for diverting water into the power canal; the gage is at the extreme left end of the left abutment, and hence is 53 feet upstream from the crest of the dam. It is graduated in feet and tenths and reads from sea level (Portland Railway, Light & Power Co. datum).

Discharge measurements of Clackamas River near Cazadero, Oreg., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 11	S. C. Hulse	154	819	27.15	1,640
26	do	165	1,200	29.54	4,360
June 14	do	149	762	26.78	1,480
14	F. C. Ebert	146	756	26.78	1,370
18	S. C. Hulse	147	746	26.70	1,350
26	do	147	741	26.60	1,270
26	F. C. Ebert	147	729	26.60	1,240
July 1	S. C. Hulse	146	726	26.50	1,190
13	do	145	710	26.38	1,050
22	do	144	694	26.29	1,000
Aug. 3	do	144	682	26.20	958
Sept. 3	do	144	668	26.10	856
15	do	144	668	26.09	840

Daily gage height, in feet, of Clackamas River near Cazadero, Oreg., for 1910.

[J. A. Brooks, observer.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	27.65	28.72	34.80	28.31	28.28	27.08	26.53	26.24	26.12	26.20	26.14	28.85
2	27.48	28.45	35.82	28.68	28.14	27.02	26.50	26.24	26.10	26.34	26.16	29.90
3	27.35	28.24	33.90	28.80	28.62	26.97	26.48	26.23	26.10	27.76	26.26	31.74
4	27.40	28.13	32.35	28.66	28.86	26.92	26.46	26.22	26.10	28.10	26.23	31.17
5	27.30	27.89	31.86	28.68	28.73	26.97	26.46	26.21	26.10	27.24	26.17	30.35
6	27.34	27.77	30.95	28.83	28.50	26.95	26.45	26.20	26.10	26.83	26.35	29.55
7	27.34	27.68	30.33	28.85	28.52	26.87	26.44	26.20	26.10	26.60	28.03	29.58
8	27.28	27.58	29.85	29.28	28.63	26.83	26.43	26.20	26.10	26.48	29.80	29.82
9	27.20	27.54	29.72	29.26	28.65	26.80	26.40	26.20	26.10	26.40	29.51	30.25
10	27.15	27.48	29.65	29.21	29.08	26.78	26.40	26.19	26.10	26.37	30.70	29.28
11	27.15	27.50	29.73	29.20	29.10	27.04	26.38	26.18	26.10	26.33	30.05	28.73
12	27.13	27.60	30.08	29.17	28.70	26.96	26.37	26.18	26.10	26.34	28.96	28.39
13	27.07	28.53	30.50	29.14	28.48	26.86	26.36	26.18	26.10	26.28	27.98	28.13
14	27.04	28.37	30.77	28.86	28.24	26.79	26.36	26.18	26.10	26.26	27.76	27.93
15	27.00	28.00	30.78	28.64	28.08	26.75	26.35	26.19	26.10	26.22	27.29	27.80
16	26.95	27.78	30.72	28.59	27.92	26.75	26.35	26.20	26.10	26.20	27.13	27.70
17	26.92	27.77	30.67	28.64	27.80	26.72	26.36	26.19	26.10	26.30	26.99	27.76
18	27.40	28.04	30.65	28.93	27.75	26.70	26.35	26.17	26.10	26.48	27.04	27.51
19	27.70	28.08	30.92	29.36	27.70	26.80	26.35	26.15	26.10	26.34	27.10	27.49
20	27.40	27.97	30.60	29.49	27.58	26.78	26.32	26.14	26.21	26.29	27.81	27.33
21	27.80	27.90	30.23	29.33	27.62	26.77	26.31	26.14	26.41	26.26	31.35	27.32
22	29.71	27.72	30.21	29.10	27.47	26.77	26.30	26.14	26.19	26.22	31.06	27.22
23	31.62	27.77	30.20	29.27	27.47	26.74	26.30	26.14	26.13	26.19	32.90	27.53
24	31.82	29.28	29.72	29.52	27.46	26.68	26.30	26.14	26.10	26.19	30.38	28.32
25	30.55	31.00	29.33	29.55	27.45	26.63	26.28	26.14	26.09	26.20	29.26	28.14
26	29.60	29.80	29.05	29.38	27.35	26.60	26.28	26.14	26.08	26.18	28.36	27.90
27	29.30	30.30	28.80	28.92	27.32	26.59	26.27	26.14	26.07	26.16	28.19	27.94
28	30.05	31.80	28.66	28.63	27.28	26.58	26.27	26.15	26.07	26.14	28.35	27.85
29	29.42	.....	28.45	28.38	27.20	26.57	26.26	26.17	26.07	26.14	29.16	27.78
30	29.07	.....	28.30	28.30	27.17	26.55	26.25	26.16	26.07	26.14	29.44	27.74
31	29.04	.....	28.34	.....	27.10	.....	26.24	26.14	.....	26.14	.....	27.61

Daily discharge, in second-feet, of Clackamas River near Cazadero, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,250	3,400	15,100	2,950	2,920	1,690	1,200	952	856	920	872	3,540
2	2,080	3,100	18,600	3,360	2,760	1,640	1,170	952	840	1,030	888	4,910
3	1,950	2,870	13,000	3,490	3,290	1,590	1,150	944	840	2,360	968	8,180
4	2,000	2,750	9,440	3,340	3,560	1,550	1,130	936	840	2,720	944	7,070
5	1,900	2,490	8,420	3,360	3,410	1,590	1,130	928	840	1,840	896	5,600
6	1,940	2,370	6,660	3,520	3,160	1,580	1,120	920	840	1,470	1,040	4,420
7	1,940	2,280	5,570	3,540	3,180	1,500	1,120	920	840	1,260	2,640	4,460
8	1,880	2,180	4,840	4,070	3,300	1,470	1,110	920	840	1,150	4,770	4,800
9	1,800	2,140	4,660	4,050	3,320	1,440	1,080	920	840	1,080	4,370	5,440
10	1,760	2,080	4,560	3,980	3,820	1,420	1,080	912	840	1,060	6,200	4,070
11	1,760	2,100	4,670	3,970	3,840	1,660	1,060	904	840	1,020	5,120	3,410
12	1,740	2,200	5,170	3,930	3,380	1,580	1,060	904	840	1,030	3,670	3,040
13	1,680	3,190	5,850	3,890	3,140	1,490	1,050	904	840	984	2,590	2,750
14	1,660	3,020	6,330	3,560	2,870	1,430	1,050	904	840	968	2,360	2,530
15	1,620	2,610	6,340	3,350	2,700	1,400	1,040	912	840	936	1,890	2,400
16	1,580	2,380	6,240	3,260	2,520	1,400	1,040	920	840	920	1,740	2,300
17	1,559	2,370	6,150	3,310	2,400	1,370	1,050	912	840	1,000	1,610	2,360
18	2,000	2,650	6,110	3,640	2,350	1,350	1,040	896	840	1,150	1,660	2,110
19	2,300	2,700	6,600	4,180	2,300	1,440	1,040	880	840	1,030	1,710	2,090
20	2,000	2,580	6,020	4,350	2,180	1,420	1,020	872	928	992	2,410	1,930
21	2,400	2,500	5,410	4,140	2,220	1,410	1,010	872	1,090	968	7,420	1,920
22	4,640	2,320	5,[illegible]30	3,840	2,070	1,410	1,000	872	912	936	6,860	1,820
23	7,940	2,370	5,360	4,060	2,070	1,390	1,000	872	864	912	10,700	2,130
24	8,340	4,070	4,660	4,390	2,060	1,330	1,000	872	840	912	5,650	2,960
25	5,940	6,750	4,140	4,420	2,050	1,290	984	872	833	920	4,050	2,760
26	4,490	4,770	3,780	4,200	1,950	1,260	984	872	826	904	3,010	2,500
27	4,100	5,520	3,490	3,620	1,920	1,250	976	872	819	888	2,820	2,540
28	5,120	8,300	3,340	3,300	1,880	1,240	976	880	819	872	3,000	2,450
29	4,260	.....	3,100	3,030	1,800	1,230	968	896	819	872	3,920	2,380
30	3,890	.....	2,940	2,940	1,770	1,220	960	888	819	872	4,280	2,340
31	3,770	.....	2,980	.....	1,710	.....	952	872	.....	872	.....	2,210

NOTE.—Daily discharge determined from a rating curve well defined between 840 and 4,500 second-feet.

Monthly discharge of Clackamas River near Cazadero, Oreg., for 1910.

[Drainage area, 685 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	8,340	1,550	2,970	4.34	5.00	183,000	A.
February	8,300	2,080	3,140	4.58	4.77	174,000	A.
March	18,600	2,940	6,290	9.18	10.58	387,000	B.
April	4,420	2,940	3,700	5.40	6.02	220,000	A.
May	3,840	1,710	2,640	3.85	4.44	162,000	A.
June	1,690	1,220	1,430	2.09	2.33	85,100	A.
July	1,200	952	1,050	1.53	1.76	64,600	A.
August	952	872	902	1.32	1.52	55,500	A.
September	1,090	819	852	1.24	1.38	50,700	A.
October	2,720	872	1,120	1.64	1.89	68,900	A.
November	10,700	872	3,340	4.88	5.44	199,000	B.
December	8,180	1,820	3,340	4.88	5.63	205,000	A.
The year	18,600	819	2,560	3.74	50.76	1,850,000	

EVAPORATION STATION NEAR CAZADERO, OREG.

A station for measuring evaporation was established May 1, 1909, in the forebay of the power plant of the Portland Railway, Light & Power Co., at Cazadero, Oreg.

The pan is of standard type, 3 feet square and 18 inches deep, with a needle point in the center to which the water surface can be adjusted at the time of observation. The observer is supplied with a cup, the contents of which will raise the water 0.1 inch. The elevation of the water surface in the forebay is about 520 feet above mean sea level. The station is maintained in cooperation with the Portland Railway, Light & Power Co.

Observations of evaporation from water surface at Cazadero, Oreg., 1910.

[Observer, Alf. Drill.]

Month.	Rain inches.	Evaporation inches.
March	4.37	0.63
April	3.77	.97
May	2.76	1.25
June	1.61	1.97
July	T.	2.42
August	0.26	1.86
September	1.18	1.22
October	4.56	.47
November	10.75	.45
December	5.88	.62
The period	35.14	11.86

CLACKAMAS RIVER AT ESTACADA, OREG.

This station, which is located in the Oregon Water Power Co.'s park at Estacada, Oreg., about 1¾ miles downstream from the Portland Railway, Light & Power Co.'s hydroelectric plant at Cazadero, was established April 6, 1908, and replaces the station formerly maintained at Barton, Oreg.

The river at this point flows in a deep canyon, and it was impossible to find a site which combined proper gaging facilities with easy accessibility. It was therefore necessary to install two gages. The upper gage—No. 1—on which daily readings are made, is located at the foot of a stairway leading to the water's edge opposite the dance hall in the park. The cable from which measurements are made is located about one-fourth mile downstream from this point, where gage No. 2 was installed. All measurements have been referred to both gages. Between the two gages there is a small amount of inflow from springs, the larger being from the left bank just above the gaging site. The flow of these springs, however, is hardly over 1 per cent of the flow of the stream at extreme low water.

The nonuniform use of the water at the power plant causes daily fluctuations in the quantity of water passing the gaging station. This fluctuation is very noticeable at low water, but becomes relatively less at higher stages. On account of these artificial variations in flow it was necessary to establish a station out of influence of the power plant. Accordingly this station, 2 miles above Cazadero, was established January 1, 1909. The discharge at the two points should be virtually the same as there are no intervening tributaries.

No discharge measurements were made during 1910, but the channel is practically permanent and the gage solidly installed. For purposes of comparison, however, a table of daily discharge at this station is given for 1910.

Daily gage height, in feet, of Clackamas River at Estacada, Oreg., for 1910.

[N. L. S. Lauryy, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.05	6.2	13.2	6.15	6.00	5.08	4.20	4.25	3.75	3.75	4.15	7.20
2	5.65	6.05	14.3	6.45	6.10	5.05	4.50	4.15	3.95	4.15	4.25	8.10
3	5.15	5.95	12.25	6.6	6.60	5.00	4.30	4.20	4.05	5.35	4.35	9.65
4	5.05	5.85	10.65	6.65	6.60	4.90	4.20	4.25	3.95	5.85	4.05	8.70
5	4.95	5.9	9.75	6.5	6.50	4.80	4.15	4.20	4.00	5.15	3.90	8.02
6	5.0	5.65	8.75	6.6	6.50	4.85	4.45	4.20	4.40	4.75	3.25	7.60
7	5.1	5.75	8.10	6.7	6.30	4.90	4.35	4.25	4.05	4.65	6.00	7.50
8	5.05	5.55	7.60	6.95	6.25	4.80	4.35	4.30	4.10	4.35	7.58	7.75
9	4.85	5.45	7.45	7.0	6.22	4.60	4.15	4.40	3.85	3.80	6.55	8.25
10	4.9	5.65	7.25	7.0	6.72	4.75	4.25	4.40	4.08	4.00	8.40	7.45
11	4.95	5.6	7.35	6.95	6.70	5.30	4.45	4.45	3.30	4.35	8.20	6.85
12	5.05	5.45	7.40	7.0	6.50	5.75	4.60	4.25	3.75	4.40	6.60	7.05
13	4.85	6.35	8.15	6.95	6.22	4.98	4.32	4.00	3.95	4.00	5.85	7.00
14	4.9	6.3	8.50	6.55	6.00	4.60	3.95	3.90	3.90	3.50	5.95	6.50
15	4.85	5.85	8.55	6.3	5.90	4.35	4.20	3.65	3.90	3.20	5.70	6.15

Daily gage height, in feet, of Clackamas River at Estacada, Oreg., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	5.0	5.75	8.50	6.35	5.90	4.45	4.10	4.15	4.20	3.25	5.60	6.15
17	4.8	5.75	8.35	6.4	5.52	4.60	4.00	4.15	3.95	4.25	5.30	5.95
18	5.05	6.0	8.20	6.55	5.35	4.65	4.40	4.32	3.45	4.30	5.30	5.35
19	5.7	6.05	8.60	6.95	5.65	4.60	4.15	4.20	3.95	4.30	5.35	5.50
20	5.7	5.85	8.20	7.1	5.30	4.55	4.10	4.28	3.95	4.35	5.70	5.50
21	5.8	5.85	7.90	6.95	5.30	4.52	4.05	4.20	4.10	4.05	8.80	5.95
22	5.85	5.75	7.85	6.75	5.20	4.55	4.20	4.15	4.20	4.05	9.40	6.10
23	7.85	5.85	7.85	7.0	5.20	4.60	4.05	4.20	3.85	3.30	10.80	6.35
24	9.85	7.25	7.30	7.2	5.25	4.60	4.25	4.15	3.90	4.05	7.50	6.50
25	8.5	8.9	6.95	7.2	5.25	4.50	4.35	4.10	3.45	4.15	6.75	5.95
26	7.15	7.65	6.85	6.95	5.20	4.30	4.28	4.10	4.05	4.00	6.25	5.90
27	7.25	8.4	6.45	6.65	5.20	4.35	4.28	3.90	4.05	4.00	5.95	6.30
28	7.65	9.85	6.45	6.4	5.10	4.65	4.22	4.00	4.15	3.80	6.35	6.00
29	7.15	.....	6.15	6.2	4.95	4.25	4.28	3.90	4.30	3.65	7.10	6.10
30	6.95	.....	6.20	6.2	5.10	4.55	4.20	3.90	4.00	3.30	7.45	5.95
31	6.65	.....	6.05	.....	5.10	.....	3.75	4.00	.....	4.10	.....	6.10

NOTE.—Gage readings, although correct for the time at which they were made, represent only approximately the daily mean on account of fluctuations caused by the operation of the power plant above.

Daily discharge, in second-feet, of Clackamas River at Estacada, Oreg., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,270	3,480	17,900	3,410	3,200	2,140	1,320	1,360	985	985	1,280	5,030
2	2,090	3,270	20,500	3,840	3,340	2,090	1,570	1,280	1,120	1,280	1,360	6,650
3	2,200	3,140	15,600	4,070	4,070	2,040	1,400	1,320	1,200	2,420	1,440	9,680
4	2,090	3,000	11,800	4,140	4,070	1,940	1,320	1,360	1,120	3,000	1,200	7,790
5	1,990	3,070	9,880	3,920	3,920	1,840	1,280	1,320	1,160	2,200	1,090	6,460
6	2,040	2,760	7,880	4,070	3,920	1,890	1,520	1,320	1,480	1,800	695	5,730
7	2,140	2,880	6,650	4,220	3,620	1,940	1,440	1,360	1,200	1,700	3,200	5,550
8	2,090	2,640	5,730	4,620	3,550	1,840	1,440	1,400	1,240	1,440	5,550	6,000
9	1,890	2,520	5,460	4,700	3,480	1,660	1,280	1,480	1,060	1,020	4,140	6,940
10	1,940	2,760	5,120	4,700	4,220	1,800	1,360	1,480	1,240	1,160	7,220	5,460
11	1,990	2,700	5,280	4,620	4,220	2,360	1,520	1,520	720	1,440	6,840	4,460
12	2,090	2,520	5,370	4,700	3,920	2,880	1,660	1,360	985	1,480	4,070	4,780
13	1,890	3,700	6,740	4,620	3,480	2,040	1,400	1,160	1,120	1,160	3,000	4,700
14	1,940	3,620	7,410	4,000	3,200	1,660	1,120	1,090	1,090	820	3,140	3,920
15	1,890	3,000	7,500	3,620	3,070	1,440	1,320	915	1,090	670	2,820	3,410
16	2,040	2,880	7,410	3,700	3,070	1,520	1,240	1,280	1,320	695	2,700	3,410
17	1,840	2,880	7,120	3,770	2,580	1,660	1,160	1,280	1,120	1,360	2,360	3,140
18	2,090	3,200	6,840	4,000	2,420	1,700	1,480	1,400	795	1,400	2,360	2,420
19	2,820	3,270	7,600	4,620	2,760	1,660	1,280	1,320	1,120	1,400	2,420	2,580
20	2,820	3,000	3,480	4,860	2,360	1,620	1,240	1,400	1,120	1,440	2,820	2,580
21	2,940	3,000	6,270	4,620	2,360	1,570	1,200	1,320	1,240	1,200	7,980	3,140
22	3,000	2,880	6,180	4,300	2,250	1,620	1,320	1,280	1,320	1,200	9,180	3,340
23	6,180	3,000	6,180	4,700	2,250	1,660	1,200	1,320	1,060	720	12,200	3,700
24	10,100	5,120	5,200	5,030	2,300	1,660	1,360	1,280	1,090	1,200	5,550	3,920
25	7,410	8,180	4,620	5,030	2,300	1,570	1,440	1,240	795	1,280	4,300	3,140
26	4,940	5,820	4,460	4,620	2,250	1,400	1,400	1,240	1,200	1,160	3,550	3,070
27	5,120	7,220	3,840	4,140	2,250	1,440	1,400	1,090	1,200	1,160	3,140	3,620
28	5,820	10,100	3,840	3,770	2,140	1,700	1,320	1,160	1,280	1,020	3,700	3,200
29	4,940	.....	3,410	3,480	1,990	1,360	1,400	1,090	1,400	915	4,860	3,340
30	4,620	.....	3,480	3,480	2,140	1,620	1,320	1,090	1,160	720	5,460	3,140
31	4,140	.....	3,270	.....	2,140	.....	985	1,160	.....	1,240	.....	3,340

NOTE.—Daily discharge determined from a well-defined rating curve. The accuracy of the determinations depends entirely on the accuracy of the gage heights.

Monthly discharge of Clackamas River at Estacada, Oreg., for 1910.

[Drainage area, 668 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.
January	10,100	1,840	3,300	4.94	5.70	203,000
February	10,100	2,520	3,770	5.64	5.87	209,000
March	20,500	3,270	7,160	10.7	12.34	440,000
April	5,030	3,410	4,250	6.36	7.10	253,000
May	4,220	1,990	2,990	4.48	5.16	184,000
June	2,140	1,360	1,780	2.66	2.97	106,000
July	1,660	985	1,340	2.01	2.32	82,400
August	1,520	915	1,280	1.92	2.21	78,700
September	1,480	720	1,130	1 69	1.89	67,200
October	3,000	670	1,310	1.96	2.26	80,600
November	12,200	695	3,990	5.97	6.66	237,000
December	9,680	2,420	4,440	6.65	7.67	273,000
The year	20,500	670	3,060	4.58	62.15	2,210,000

LEWIS RIVER BASIN.[1]

GENERAL FEATURES.

Lewis River heads in Adams Glacier, on the northwest slope of Mount Adams, flows in a general southwesterly direction, and empties into Columbia River 19 miles below Vancouver, Wash. Its lower half forms the boundary line between Cowlitz and Clarke counties, Wash., its upper half is entirely within Skamania County; the total length of the main river is 110 miles, and the stream drops 7,900 feet in that distance. The river is navigable by small boats as far as Ariel except during the low-water season. The total area drained by the Lewis is 1,070 square miles.

The principal tributaries in order downstream are, from the north, Muddy River, Pine Creek, Swift Creek, Cougar Creek, and Speilei Creek; from the south, Drift Creek, Siouxon Creek, Canyon Creek, Cedar Creek, and South Fork. Of these South Fork has the largest drainage area, but contributes a relatively small portion of the flow. Muddy River and Pine and Swift creeks supply a large part of the tributary discharge.

The area is mountainous and the streams all flow in canyons. Mount Adams, 12,307 feet high, and Mount St. Helens, 9,750 feet (height not accurately determined), are the prominent topographic features.

About one-fourth of the Lewis River basin lies within the Columbia National Forest, and the entire area is essentially densely forested. At many points along the main stream flumes lead from the high

[1] For more detailed description of Lewis River basin see Water-Supply Paper U. S. Geol. Survey No. 253, pp. 60–64; No. 272, pp. 465–468.

mountains to the river bank and are used for floating shingle bolts from the hills into the river. In the canyon of the main stream there are numerous dam sites where a moderate amount of storage could be developed for the use of a power plant with daily load variations. During the summer of 1909 the United States Geological Survey made a water-power survey of this basin. Discharge measurements were made on all important tributaries and on the main stream at various points to determine the summer flow.[1]

Being glacier fed, the river near the headwaters is heavily loaded with glacial silt, which, however, gradually settles out, leaving the water in the lower reaches comparatively clean.

LEWIS RIVER NEAR COUGAR, WASH.

This gaging station, which is located 1,000 feet above the mouth of Swift Creek, at the first riffle below a large outcrop of rock on the right bank, 2 miles above Peterson's ranch and 7 miles above Cougar post office, Wash, was established July 27, 1909.

The gage is a vertical staff, graduated to feet and tenths in two sections, the first 12 feet being attached to a point of the rock above mentioned.

Measurements are made by use of a meter running on a small cable and operated from the bank or from a boat.

This station is intended as a permanent one, although facilities for making measurements at high stages have not yet been installed. It is maintained in cooperation with H. L. Gilbert, of Portland, Oreg.

The following discharge measurement was made by H. L. Gilbert:

June 22, 1910: Width, 100 feet; area, 1,210 square feet; gage height, 4.30 feet; discharge, 2,020 second-feet.

Measured from a boat below Swift Creek, which was estimated to be carrying 200 second-feet.

Daily gage height, in feet, of Lewis River near Cougar, Wash., for 1910.

[Ole Peterson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.7	5.2	8.0	4.1	6.4	5.4	3.9	3.25	3.1	3.15	3.4	5.6
2	3.65	5.0	11.05	4.6	6.6	5.25	3.9	3.25	3.1	3.8	3.45	5.9
3	3.5	4.8	9.6	4.75	6.7	5.0	4.0	3.2	3.1	6.2	3.8	6.3
4	3.5	4.7	8.0	4.8	6.8	4.9	4.0	3.3	3.1	5.5	3.6	6.6
5	3.45	4.5	7.2	4.7	6.8	5.0	3.95	3.3	3.05	4.7	3.5	6.5
6	3.4	4.4	6.9	4.6	6.85	4.8	3.9	3.25	3.05	4.2	3.7	6.6
7	3.35	4.3	6.1	4.4	7.0	4.65	3.85	3.25	3.0	4.1	6.2	6.6
8	3.3	4.1	5.5	4.8	7.2	4.5	3.8	3.3	3.0	3.9	5.7	6.7
9	3.35	4.0	5.3	5.0	7.4	4.5	3.8	3.3	2.95	3.85	5.45	6.6
10	3.35	3.9	5.2	4.9	7.9	4.45	3.8	3.25	2.95	3.7	12.0	6.5
11	3.4	3.95	5.0	5.3	8.2	5.5	3.75	3.25	3.0	3.6	10.5	6.1
12	3.4	3.9	5.2	5.2	7.8	5.1	3.7	3.3	3.0	3.55	8.2	5.7
13	3.3	4.2	6.7	5.0	7.3	4.7	3.7	3.3	2.95	3.5	6.7	5.5
14	3.3	4.0	7.0	4.9	7.0	4.65	3.6	3.25	3.0	3.5	6.0	5.3
15	3.3	3.9	7.3	4.7	6.7	4.6	3.6	3.2	3.0	3.5	5.6	5.2

[1] Water-Supply Paper U. S. Geol. Survey No. 253, 1910, pp. 72-73.

Daily gage height, in feet, of Lewis River near Cougar, Wash., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	3.35	3.7	7.6	4.5	6.6	4.5	3.55	3.2	2.95	3.55	5.4	5.0
17	3.35	3.7	7.9	4.6	6.4	4.35	3.6	3.2	2.95	4.85	5.0	4.9
18	3.4	3.75	8.4	4.7	6.45	4.3	3.5	3.2	3.0	4.4	4.9	4.7
19	3.4	3.8	8.7	5.2	6.5	4.7	3.55	3.2	2.95	4.1	5.0	4.6
20	3.3	3.7	8.8	5.6	6.4	4.6	3.5	3.2	2.9	3.9	7.4	4.5
21	3.4	3.65	8.8	5.5	6.2	4.5	3.55	3.2	2.9	3.85	13.8	4.4
22	3.6	3.7	8.6	5.5	6.2	4.3	3.5	3.25	2.9	3.75	10.4	4.4
23	5.2	4.1	8.3	5.9	6.0	4.2	3.5	3.25	2.9	3.7	8.6	4.6
24	7.4	4.7	6.8	6.4	6.1	4.1	3.5	3.3	2.85	3.75	7.7	5.1
25	6.3	5.0	5.6	6.5	6.0	4.2	3.5	3.3	2.85	3.8	6.8	5
26	5.8	4.6	4.9	5.9	5.8	4.2	3.45	3.3	2.9	3.7	6.3	4.8
27	5.5	5.0	4.7	5.6	5.7	4.1	3.45	3.3	2.9	3.6	6.0	4.7
28	5.2	5.9	4.5	5.4	5.4	4.1	3.4	3.25	2.9	3.55	5.7	4.65
29	5.0	.....	4.3	5.0	5.3	4.0	3.35	3.2	3.0	3.55	5.6	4.6
30	5.0	.....	4.2	4.8	5.4	3.95	3.35	3.2	3.1	3.5	5.5	4.7
31	5.1	.....	4.0	.....	5.5	.....	3.3	3.15	.....	3.45	.....	4.6

NOTE.—New gage set by the observer about July 1 below the mouth of Swift Creek. He made comparative readings of the two gages for a time, but later read only the lower gage. The two gages were set to read the same, and were found to record practically the same fluctuation.

COWLITZ RIVER BASIN.

GENERAL FEATURES.

Cowlitz River rises in the Cascades just east of Mount Rainier and near the eastern boundary of the Mount Rainier National Park and flows about 150 miles in a general southwesterly course to its junction with the Columbia near Kelso. The total drainage area of the Cowlitz is about 2,460 square miles.

The principal headwater stream, the Ohanapecosh, is joined by the Clear Fork from the south and Muddy Fork from the north, which enter about 2 miles apart near Lewis. Below the junction the river is known as the Cowlitz.

Elevations within this basin range from more than 14,000 feet at Mount Rainier to tidewater at the mouth. The course of the river is through a succession of valleys and canyons. The valleys are very fertile and well adapted to agriculture; the canyons afford sites fairly favorable for power development. The best waterpower sites are on the three headwater forks and on Lake and Johnson creeks, which enter the river just below their junction. Some storage is available at Packwood Lake on Lake Creek. The lower part of the river below Castle Rock is navigable for river steamers.

Practically the whole basin of the Cowlitz was once heavily forested; some timber has been cut and a greater area has been burnt over, but the stand of timber is still heavy. The rainfall ranges from about 40 inches in the lower valley to probably over 100 inches in the headwaters.

Cowlitz River is subject to enormous floods. In many places high-water marks, 50 or 60 feet above the low stage of the river, show the level reached by the highest recorded flood—that of 1896.

Of the tributaries of the river, Cispus and Toutle are the largest. Cispus River rises in the glaciers of Goat Rocks on the main Cascade divide, flows westward, and enters the Cowlitz about 10 miles below Randle. Its principal tributaries are Muddy and Adams forks, which flow from Mount Adams northward into the Cispus about 20 miles from its head, and Anastass Creek, or North Fork, which enters from the north lower down. Its drainage basin comprises 453 square miles, is mostly mountainous, and is heavily forested except for a considerable burned area near the head. The river affords some excellent power sites, especially along its middle course, where most of the fall is concentrated. Some storage is available in meadows above Muddy Fork.

Toutle River rises in Spirit Lake on the northwestern slope of Mount St. Helens, flows in a general westerly direction, and empties into Cowlitz River 2 miles above Castle Rock, and 10 miles above the mouth of the river. Its principal tributaries, in downstream order, are Cold Creek, Hoffstadt Creek, and Green River from the north, and Alder Creek, South Fork, and Outlet Creek from the south. The total drainage area is 510 square miles. The lands contiguous to the lower portion of the river are high and rolling, but not rugged. Upstream these rolling lands are gradually replaced by narrow valleys and bench lands, topped by bold peaks, with scarred and eroded sides. At present there are no developed water powers in this basin, but near the outlet of Spirit Lake a number of crib dams and diverting flumes have been constructed.

COWLITZ RIVER AT RANDLE, WASH.

This station, which is located at the ferry at Randle, Wash., in sec. 17, T. 12 N., R. 7 E., 8 miles above the mouth of Cispus River, was established October 1, 1910.

The records show practically the total flow at the lower end of the upper Cowlitz Valley. The drainage area at this point is 519 square miles.

The gage is a vertical staff, in three sections, near the ferry.

Measurements are made from a boat at the ferry. No measurements have been made except at medium stage and no computations of daily discharge can be made.

Discharge measurements of Cowlitz River at Randle, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 26	E. S. Fuller	260	1,330	4.60	2,960
Nov. 27	H. P. Gilkey	278	1,450	5.75	4,260

Daily gage height, in feet, of Cowlitz River at Randle, Wash., for 1910.

[D. C. Bishop, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	1.65	2.5	5.85	11	3.25	17.4	5.3	21	2.85	16.55	3.15
2	2.2	2.4	6.35	12	2.95	11.2	4.35	22	2.65	16.3	3.05
3	5.2	2.3	6.6	13	2.55	7.95	4.25	23	2.45	12.0	3.25
4	6.5	2.2	7.15	14	2.35	6.6	4.05	24	2.7	9.5	5.15
5	6.15	2.25	7.7	15	2.3	5.65	3.3	25	4.8	8.0	4.45
6	5.5	2.7	6.15	16	2.0	5.15	3.15	26	4.35	6.45	4.15
7	5.8	5.45	7.65	17	3.35	4.65	3.45	27	3.65	5.8	4.4
8	5.25	6.85	6.85	18	4.0	4.3	2.4	28	3.25	5.15	4.15
9	4.5	6.5	6.7	19	3.4	3.9	2.15	29	2.95	5.15	3.45
10	3.7	13.1	6.3	20	3.2	5.1	2.3	30	2.75	5.7	4.2
								31	2.60	.....	4.7

COWLITZ RIVER AT MAYFIELD, WASH.

This station, which was established August 25, 1910, is located at the highway bridge at Mayfield, in sec. 21, T. 12 N., R. 1 E., above Winston Creek and about 4 miles below Tilton River, an important tributary from the north.

The records show the discharge through the lower canyons, several of which, both above and below this station, afford dam sites for power development.

The gage is a vertical staff fastened to the rock just above the bridge.

Measurements can be made from the bridge only at extreme low water.

No measurements at medium or high stages have been obtained as yet and computations of discharge can not be made until more data are available.

The following measurement was made by C. W. Harris:

August 25, 1910: Width, 67 feet; area, 962 square feet; gage height, 1.20 feet; discharge, 1,330 second-feet.

Daily gage height, in feet, of Cowlitz River at Mayfield, Wash., for 1910.

[J. B. Justice, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.1	1.4	.....	9.0	16	.....	0.9	.....	.....	8.0
2	.....	1.15	3.4	.....	9.4	17	.....	1.0	.....	.....	8.0
3	.....	1.05	6.4	.....	12.0	18	.....	1.0	.....	.....	7.9
4	.....	1.1	.....	.....	13.2	19	.....	1.0	.....	.....	7.9
5	.....	1.1	.....	.....	13.0	20	.....	1.1	.....	.....	7.8
6	.....	1.1	.....	.....	13.0	21	.....	1.1	.....	.....	7.8
7	.....	1.1	.....	.....	12.4	22	.....	1.1	.....	.....	7.8
8	.....	1.05	.....	.....	11.6	23	.....	1.2	.....	.....	7.8
9	.....	1.0	.....	.....	13.4	24	.....	1.2	.....	.....	7.8
10	.....	1.0	.....	.....	14.2	25	1.2	1.0	.....	.....	7.9
11	.....	1.0	.....	.....	14.0	26	1.1	.9	.....	.....	7.8
12	.....	.9	.....	.....	13.0	27	1.1	.9	.....	.....	7.7
13	.....	.8	.....	.....	9.4	28	1.1	.9	.....	.....	7.7
14	.....	.6	.....	.....	9.0	29	1.15	1.1	.....	.....	7.6
15	.....	.5	.....	.....	8.0	30	1.1	1.2	.....	.....	7.6
						31	1.1	.....	.....	.....	7.6

NOTE.—Water over lower section of gage after Oct. 4.

CISPUS RIVER NEAR RANDLE, WASH.

This station, which is located about 12 miles southeast of Randle, Wash., and one-fourth mile below the mouth of McCoy Creek, in sec. 18, T. 11 N., R. 8 E., unsurveyed, was established October 25, 1910.

The records show the run-off of the upper portion of the basin, and indicate the quantity of water available for the development of power.

The vertical staff gage is spiked to a stump near the private cable from which measurements are made. The datum of the gage has remained unchanged.

Sufficient measurements have not yet been made to define a rating curve.

Discharge measurements of Cispus River near Randle, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 25	E. S. Fuller	160	249	1.93	977
Nov. 28	H. P. Gilkey	166	421	2.95	1,650

Daily gage height, in feet, of Cispus River near Randle, Wash., for 1910.

[Arthur Lane, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1		1.5	2.7	11		4.7	2.9	21		5.2	2.5
2		1.5	3.2	12		3.9	2.8	22		4.3	2.5
3		1.6	3.4	13		3.6	2.7	23		3.9	2.6
4		1.5	3.4	14		3.4	2.7	24		3.6	2.6
5		1.5	3.3	15		3.0	2.7	25	1.9	3.4	2.5
6		1.6	3.2	16		2.8		26	1.7	3.2	2.5
7		2.4	3.2	17		2.7		27	1.7	3.1	2.5
8		2.3	3.3	18		2.6	2.6	28	1.6	2.9	2.5
9		2.3	3.1	19		2.8	2.6	29	1.6	2.8	2.5
10		6.0	3.0	20		2.9	2.5	30	1.5	2.8	2.5
								31	1.5		2.5

TOUTLE RIVER NEAR CASTLE ROCK, WASH.

This station, which is located near the quarter corner between secs. 12 and 13, T. 10, R. 1 W., about 1½ miles southeast from Tower, Wash., and about 2½ miles below the South Fork of Toutle River and Outlet Creek, was established September 4, 1909.

The gage is at the downstream end of a large rock on the left bank.

A cable was installed in June, 1910, for making high-water measurements. At extremely low stages the river can be measured by wading.

The gage records at this station are good. Conditions for making measurements are, however, not of the best, and no measurements have yet been made at extreme high stages.

Discharge measurements of Toutle River near Castle Rock, Wash., in 1909–10.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1909.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 4	C. W. Harris	124	234	1.24	416
1910.					
June 12	F. C. Ebert	108	796	2.25	1,280
July 16	do	104	709	1.37	596
Dec. 4	John Dubuis	121	1,010	4.05	4,230

Daily gage height, in feet, of Toutle River near Castle Rock, Wash., for 1910.

[G. K. Walker, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.70	3.80	8.70	2.64	2,65	2.50	1.62	1.35	0.83	1.02	1.46	.....
2	2.45	3.54	11.00	2.81	2.56	2.40	1.61	1.35	1.00	1.60	1.50	.....
3	2.35	3.25	8.60	3.20	2.76	2.22	1.53	1.32	.99	3.51	1.43	.....
4	2.25	3.15	6.35	3.08	2.61	1.92	1.50	1.10	.98	4.15	1.72	3.90
5	2.23	3.03	5.50	2.98	2.60	2.00	1.53	1.10	.95	3.20	1.60	4.00
6	2.20	2.99	5.00	3.22	2.52	1.98	1.54	1.09	.96	2.48	1.82	3.85
7	2.47	2.93	4.55	3.02	2.61	2.00	1.48	1.00	.97	2.17	1.90	3.75
8	2.40	2.82	4.40	4.00	2.80	1.99	1.46	1.10	.95	1.90	2.98	3.55
9	2.35	2.80	4.24	4.60	2.85	1.82	1.47	1.00	.93	1.93	5.00	3.70
10	2.30	2.80	4.10	4.22	3.12	1.80	1.50	1.02	.91	2.00	7.84	3.45
11	2.25	2.77	3.80	3.96	3.70	2.00	1.52	1.05	.99	1.87	6.60	3.25
12	2.20	2.70	3.75	3.80	3.25	2.42	1.50	1.05	.97	1.84	5.90	3.09
13	2.18	4.30	4.00	3.63	2.90	2.12	1.48	1.02	.93	1.77	4.00	2.90
14	2.18	3.65	4.30	3.41	2.89	1.98	1.42	1.00	.89	1.75	3.40	2.80
15	2.16	3.30	4.34	3.25	2.70	1.90	1.48	1.03	.89	1.60	3.00	2.62
16	2.14	3.10	4.20	3.10	2.55	1.88	1.42	1.07	1.00	1.58	2.70	2.60
17	2.10	3.10	4.20	3.00	2.51	1.85	1.38	1.06	1.32	1.79	2.55	2.54
18	4.00	2.99	4.10	2.97	2.50	1.80	1.32	1.00	1.18	2.46	2.44	2.46
19	3.50	3.00	4.36	3.20	2.52	1.78	1.30	1.00	1.00	2.10	2.60	2.37
20	3.00	2.90	4.16	3.35	2.40	2.00	1.32	.98	.99	1.90	3.90	2.31
21	2.75	2.85	4.10	3.30	2.31	1.82	1.30	.96	.98	1.80	8.50	2.31
22	2.70	2.80	4.00	3.15	2.36	1.76	1.28	.80	.98	1.70	.....	2.22
23	3.75	2.90	4.00	3.20	2.44	1.70	1.26	.81	.98	1.80	.....	2.52
24	6.00	4.72	3.75	3.40	2.58	1.65	1.35	.82	.95	1.68	.....	3.00
25	5.10	5.30	3.50	3.60	2.62	1.62	1.30	.80	.95	2.00	.....	2.90
26	4.50	5.00	3.25	3.65	2.54	1.52	1.28	.80	.94	1.90	.....	2.85
27	4.00	5.50	3.04	3.35	2.52	1.64	1.29	.81	.92	1.75	.....	2.80
28	4.00	6.50	3.00	3.00	2.32	1.60	1.33	.85	.89	1.65	.....	2.79
29	3.70	.....	2.87	2.88	2.66	1.58	1.30	1.00	.89	1.58	.....	3.70
30	3.60	.....	2.74	2.75	2.44	1.55	1.28	.95	.88	1.50	.....	3.37
31	4.00	.....	2.78	.....	2.38	.....	1.20	.94	.....	1.48	.....	3.27

Daily discharge, in second-feet, of Toutle River near Castle Rock, Wash., for 1909–10.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1909.					1909.				
1	.....	558	1,560	8,950	16	410	420	1,920	3,680
2	.....	498	9,900	6,370	17	410	415	1,640	3,200
3	.....	470	16,100	5,060	18	405	410	2,800	2,830
4	437	442	8,230	4,130	19	390	426	7,620	2,600
5	442	426	5,250	3,560	20	390	810	11,400	2,360
6	420	551	4,130	3,060	21	855	1,420	7,620	2,220
7	420	709	3,190	2,800	22	538	1,320	15,700	1,990
8	415	558	3,920	2,720	23	470	891	18,000	1,850
9	405	525	4,130	2,630	24	442	970	22,500	1,770
10	415	514	4,340	2,580	25	448	846	11,400	1,710
11	498	503	3,520	2,560	26	470	754	7,450	1,640
12	437	470	2,970	7,450	27	420	695	5,620	1,580
13	420	464	2,830	7,330	28	415	653	6,500	1,520
14	420	464	2,440	5,390	29	492	770	10,400	1,460
15	415	442	2,120	4,380	30	709	819	16,100	1,380
					31	.....	900	.....	2,140

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	1,850	3,720	21,700	1,770	1,780	1,580	744	575	342	418	636	2,460
2	1,520	3,220	35,600	2,000	1,660	1,460	737	575	410	730	660	2,800
3	1,400	2,720	21,100	2,630	1,930	1,270	681	560	406	3,170	648	3,330
4	1,300	2,540	10,800	2,430	1,720	978	660	450	402	4,450	816	3,900
5	1,280	2,350	7,920	2,270	1,710	1,050	681	450	390	2,630	730	4,130
6	1,250	2,280	6,500	2,660	1,610	1,030	688	446	394	1,560	896	3,820
7	1,540	2,190	5,370	2,330	1,720	1,050	648	410	398	1,220	960	3,620
8	1,400	2,020	5,010	4,130	1,990	1,040	636	450	390	960	2,270	3,240
9	1,490	1,990	4,650	5,490	2,060	896	642	410	382	987	2,300	3,520
10	1,350	1,990	4,340	4,600	2,490	880	660	418	374	1,050	17,200	3,060
11	1,300	1,950	3,720	4,050	3,520	1,050	674	430	406	936	11,800	2,720
12	1,250	1,850	3,620	3,720	2,720	1,480	660	430	398	912	9,210	2,440
13	1,230	4,780	4,130	3,390	2,140	1,170	648	418	382	856	4,130	2,140
14	1,230	3,420	4,780	2,990	2,120	1,030	612	410	366	840	2,970	1,990
15	1,210	2,800	4,870	2,720	1,850	960	648	422	366	730	2,300	1,740
16	1,190	2,460	4,560	2,460	1,640	944	612	438	410	716	1,850	1,710
17	1,150	2,460	4,560	2,300	1,590	920	590	434	560	872	1,640	1,610
18	4,130	2,280	4,340	2,250	1,580	880	560	410	490	1,530	1,510	1,530
19	3,150	2,300	4,920	2,630	1,610	864	550	410	410	1,150	1,710	1,430
20	2,300	2,140	4,470	2,880	1,460	1,050	560	402	406	960	3,920	1,360
21	1,920	2,060	4,340	2,800	1,360	896	550	394	402	880	20,600	1,360
22	1,850	1,990	4,130	2,540	1,420	848	540	330	402	800	12,600	1,270
23	3,620	2,140	4,130	2,630	1,510	800	530	334	402	880	7,330	1,610
24	9,550	5,790	3,620	2,970	1,680	765	575	338	390	786	5,250	2,300
25	6,770	7,330	3,150	3,330	1,740	744	550	330	390	1,050	3,720	2,140
26	5,250	6,500	2,720	3,420	1,630	674	540	330	386	960	3,150	2,060
27	4,130	7,920	2,360	2,880	1,610	758	545	334	378	840	2,630	1,990
28	4,130	11,400	2,300	2,300	1,370	730	565	350	366	765	2,460	1,980
29	3,520	.....	2,100	2,110	1,790	716	550	410	366	716	2,300	3,520
30	3,330	.....	1,910	1,920	1,510	695	540	390	362	660	2,300	2,920
31	4,130	.....	1,960	.....	1,440	.....	500	386	.....	648	.....	2,750

NOTE.—Daily discharge determined as follows: Sept. 4 to Nov. 24, 1909, from rating curve which is derived from one discharge measurement and the form of the 1910 curve, and is well defined between 400 and 1,500 second-feet; Nov. 25, 1909, to Dec. 21, 1910, from curve fairly well defined between 500 and 5,000 second-feet.

Monthly discharge of Toutle River near Castle Rock, Wash., for 1909–10.

[Drainage area, 474 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1909.							
September 4–30	855	390	460	0.970	0.97	24,600	A.
October	1,420	410	649	1.37	1.58	39,900	A.
November	22,500	1,560	7,380	15.6	17.40	439,000	B.
December	8,950	1,380	3,320	7.0	8.07	204,000	B.
1910.							
January	9,550	1,150	2,970	6.27	7.23	183,000	B.
February	11,400	1,850	3,450	7.28	7.58	192,000	B.
March	35,600	1,910	6,440	13.6	15.68	396,000	B.
April	5,490	1,770	2,890	6.10	6.81	172,000	B.
May	3,520	1,360	1,810	3.82	4.40	111,000	B.
June	1,580	674	974	2.05	2.29	58,000	A.
July	744	500	609	1.28	1.48	37,400	A.
August	575	330	415	.876	1.01	25,500	B.
September	560	342	398	.840	.94	23,700	B.
October	4,450	418	1,150	2.43	2.80	70,700	A.
November	20,600	636	4,350	9.18	10.24	259,000	B.
December	4,130	1,270	2,470	5.21	6.01	152,000	B.
The year	35,600	330	2,320	4.89	66.47	1,680,000	

CHEHALIS RIVER BASIN.

GENERAL FEATURES.

Chehalis River rises near the southwestern corner of Washington, in Pacific and Lewis counties, and follows a circuitous course northeastward, northwestward, and westward to the head of Grays Harbor, into which it discharges. Its principal tributaries are Satsop, Wynoochee, and Whishah rivers, which rise in the Olympic Peninsula, and enter the Chehalis in its lower course. These streams are probably valuable for power, but little information of any sort is available concerning them. The upper Chehalis and the principal eastern tributaries, Newaukum and Skookumchuck rivers, drain an area of hills and valleys and are relatively unimportant for power development.

Irrigation is not practiced, but may be resorted to later, as the precipitation is poorly distributed throughout the year, the summer being usually very dry.

CHEHALIS RIVER NEAR CENTRALIA, WASH.

This gaging station, which is located at the highway bridge about three-fourths of a mile southwest of Centralia, Wash., and a few hundred yards above the mouth of Skookumchuck River, was established October 3, 1910.

Discharge measurements are made from the bridge to the abutment of which the vertical staff is attached.

Sufficient measurements have not yet been obtained to define a rating curve.

Discharge measurements of Chehalis River at Centralia, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Feet.*	*Sec.-ft.*
Oct. 3	F. F. Henshaw	177	3,880	8.67	4,890
Dec. 2	John Dubuis	174	3,180	5.55	3,770

Daily gage height, in feet, of Chehalis River at Centralia, Wash., for 1910.

[John Arveson, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	2.8	5.6	11	4.15	14.6	5.6	21	3.5	15.1	4.45
2	.....	2.5	5.6	12	3.75	11.75	4.9	22	3.3	19.2	3.3
3	.....	3.2	6.7	13	3.45	7.7	4.45	23	3.2	15.7	4.4
4	.....	3.3	7.8	14	3.25	5.8	4.0	24	3.05	12.8	7.1
5	.....	3.2	8.4	15	3.1	4.8	3.8	25	3.15	9.6	7.3
6	.....	2.9	9.4	16	3.0	4.1	3.7	26	3.1	7.0	6.05
7	.....	3.6	8.5	17	2.9	3.7	3.4	27	3.0	5.8	5.9
8	.....	7.4	7.6	18	5.05	3.8	4.0	28	2.8	5.1	5.3
9	4.6	6.3	7.4	19	4.4	3.95	3.8	29	2.7	4.4	4.8
10	4.55	12.4	6.45	20	3.75	8.0	3.5	30	2.8	5.8	6.05
								31	2.5	.....	6.8

PUGET SOUND BASIN.

GENERAL FEATURES.

Puget Sound is an inland projection of the Pacific Ocean, so situated that, together with its connecting straits, it receives the greater part of the drainage from the streams of western Washington.

The Strait of Juan de Fuca extends inland from Cape Flattery about 100 miles; at Port Townsend it turns and as Puget Sound proper extends southward in the form of a narrow devious fiord, having it southern extremity at Olympia. Hood Canal branches off about 15 miles south of Port Townsend and extends back southwestward about 50 miles to the Great Bend, where it courses to the eastward until it reaches within 2 or 3 miles of the head of Case Inlet, a branch of Puget Sound near its head. The body of land thus inclosed is known as the Great Peninsula.

North of Port Townsend the Strait of Juan de Fuca is connected by a number of channels between the islands with Georgia Strait, which lies between Vancouver Island and the British Columbia mainland.

The streams of the Puget Sound drainage will be taken up by the body of water into which they drain, as follows:

Streams tributary to Hood Canal.

Dosewallips River.
Duckabush River.
Skokomish River.

Streams tributary to Puget Sound proper.

Nisqually River.
Puyallup River.
White River.
Green River.

Streams tributary to Puget Sound proper—Continued.

Cedar River.
Snohomish River.
Stilliguamish River.
Skagit River.

Streams tributary to Georgia Strait.

Whatcom Creek.
Nooksack River.

Certain physical features are possessed in common by all the streams of the Puget Sound basin. They are capable of furnishing great quantities of water power, as the fall is great and the flow generally well sustained during the summer months. The area is perhaps one of the most densely forested sections of the United States, a large portion of the headwaters of all the streams being included within the boundaries of national forests.

The mean annual rainfall of this area varies greatly from point to point. Puget Sound has long been noted for its excessive rainfall, yet in the very midst of this area of abundant precipitation is found a small section that is almost semiarid. The mean annual rainfall at Olympia is 55 inches, at Tacoma 47, at Seattle 36. West of Seattle, on Hood Canal, the precipitation is 76 inches per annum, while 35 miles to the north, at Port Townsend, the precipitation is only 21 inches. Across Admiralty Strait from Port Townsend the rainfall is 23 inches. The country adjacent to Port Townsend lies to the northeast of the Olympic Mountains in the path of the prevailing winds of the southwest, but the winds are deprived of a large part of their moisture before Port Townsend is reached. Northeastward the precipitation gradually increases again, and at Marblemount it is 47 inches per annum. The only reliable records of precipitation near the summit of the Cascades have been obtained at Snoqualmie Falls, where, at an elevation of 438 feet the precipitation is 60 inches. It is probable that on the summit of the Cascades the annual precipitation is 120 inches or more. A large part of the precipitation in this portion of the country falls during the nine months from September to May. On the summit of the Cascades it is mostly snowfall. Snow deposits during a single winter frequently aggregate 40 feet or more. When these snows disappear in the spring, high waters may be expected in all streams draining these mountains. The regular spring run-off, however, is rarely high enough to do a great amount of damage, as the streams are very steep and carry the water away rapidly. Climatic influences, however, frequently combine to cause very destructive floods. These usually occur in the fall after the first heavy snowfall, and are caused by chinook winds from the southwest when accompanied by rain. These winds are annual occurrences, but only when they follow a heavy precipitation of early snow do they cause damaging floods.

The only records of long duration are those obtained on Cedar River. From these records it appears that the year 1905 was an exceptionally low year as far as run-off was concerned, and 1897 and 1899 wet years.

DOSEWALLIPS RIVER BASIN.

GENERAL FEATURES.

Dosewallips River rises on the high divide of the Olympic Range an altitude of 6,000 or 7,000 feet, and flows eastward approximately 35 miles to Hood Canal, which it enters at the port of Brinnon, Wash., in sec. 2, T. 25 N., R. 2 W. The only important tributary is the West Fork, which comes in from the south about 25 miles above the mouth of the stream. The drainage area comprises 115 square miles of the eastern slopes of the Olympic Range, chiefly in Jefferson County, Wash., and the greater part is located in the Olympic National Forest.

The best available map of this area is the Forest Service map of the Olympic Forest.

This drainage basin consists of a series of narrow, very steep-sided valleys, running northeast and southwest, separated by rocky and rugged mountain tops. The rocks are slates and shales and the soil is coarse gravel with a few small pockets of loam in the narrow valleys. Approximately 50 square miles of this area is more than 4,000 feet above sea level, and the vegetation is typically Alpine. Below this level the area is heavily forested with red fir and hemlock, and along the stream bed a small amount of cedar.

During the winter months the greater part of the area is deeply covered with snow. The upper slopes hold the precipitation until late in summer. The low water comes in February when most of the streams are ice bound, and again in September when the first cold nights have shut off the snow water from the upper slopes while the lower stretches are still dry from the summer drouth.

The stream can not be used for driving logs because of the nature of the canyons in its upper courses and the low banks and shallow bars below. The canyons afford opportunities for power development, but little storage is available.

DOSEWALLIPS RIVER NEAR BRINNON, WASH.

This station, which is located at the highway bridge 1 mile north of Brinnon post office and one-third mile above the mouth of the river, in NE. ¼ sec. 3, T. 23 N., R. 2 W., was established October 30, 1910, in cooperation with the United States Forest Service.

Discharge measurements are made from the highway bridge or at low water by wading. The bridge makes a large angle with the current, and at high stages the water flows around the gage in a slough, which is also measured.

The gage had to be moved in December, as the sand had filled in around it, but it was reset at the same datum.

Records are continuous except for the period when the gage was covered by sand. The relation between gage heights and discharge is not affected by logging, by ice, or by artificial control, but the accuracy is reduced to some extent by shifting of the channel.

Discharge measurements of Dosewallips River near Brinnon, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 24 [a]	H. P. Gilkey	85	90.2	2.80	187
Oct. 30	do	104	114	2.80	195
Dec. 11	do	183	273	4.59	596

[a] Measured by wading.

Daily gage height, in feet, of Dosewallips River near Brinnon, Wash., for 1910.

[W. R. Frey, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1		2.9		11		4.2	4.6	21		5.6	4.2
2		2.9		12		3.6	4.5	22		5.1	4.2
3		2.8		13		3.6	4.4	23		4.7	4.8
4		2.8		14		3.4	4.3	24			4.7
5		3.1		15		3.3	4.3	25			4.6
6		3.2		16		2.9	4.4	26			4.4
7		3.2		17		2.9	4.3	27			4.3
8		3.2		18		2.9	4.3	28			4.2
9		3.4		19		3.0	4.3	29			4.2
10		5.9	4.6	20		6.2	4.3	30	2.8		4.2
								31	2.8		4.2

DUCKABUSH RIVER BASIN.

GENERAL FEATURES.

Duckabush River flows nearly due east 25 miles to its mouth on Hood Canal, near Duckabush post office, in the NE. ¼ sec. 21, T. 25 N., R. 2 W. Its drainage area comprises the southeastern part of Jefferson County, Wash., and is wholly within the Olympic National Forest. Its tributaries are all small.

The topography of the basin is very rough, the valleys being narrow and the slopes angular. Altitudes range from sea level to 6,000 or 8,000 feet above near the head of the river. Approximately 40 square miles of the basin lie within the zone of alpine vegetation, which extends from the divide down to an altitude of 3,500 or 4,000 feet, and about 10 per cent of that area is rocky and barren.

The bottoms have a soil of coarse gravel and loam, which grows thinner up the slopes. The undergrowth and litter are heavy in the bottoms and lower slopes, but thin on the upper. The valleys are heavily timbered with a mixed stand of red fir, hemlock, and cedar. There are two canyons on this river course which offer feasible power sites.

DUCKABUSH RIVER NEAR DUCKABUSH, WASH.

This station, which is located in SW. ¼ sec. 1, T. 25 N., R. 3 W., one-eighth mile above the head of the lower canyon, three-fourths mile upstream from Duckabush ranger station, which is 5 miles above the mouth of the river and 1 mile above Corey Creek, the only important tributary below the station, was established August 19, 1910, in cooperation with the United States Forest Service.

The drainage area above the station is 81 square miles.

The gage is a vertical staff in two sections, fastened to a large log on the left bank.

The channel is composed of course gravel and small bowlders and shifts at high water.

Discharge measurements are made from a cable and car 200 feet above the gage, or, at low water, by wading.

No water is diverted above the station.

The relation between gage height and discharge is not affected by ice, logs, nor artificial control.

Discharge measurements of Duckabush River near Duckabush, Wash., for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 23	H. P. Gilkey	51	78.2	3.48	106
Oct. 30	do	38	63.3	3.78	125
Dec. 11	do	62	112	2.77	537

Daily gage height, in feet, of Duckabush River near Duckabush, Wash., for 1910.

[Edw. Newman, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.56	4.40	3.78		16			3.78	3.80	2.70
2		3.56	4.35	3.80		17			4.80	3.80	2.69
3		3.56	5.41	3.80		18			4.71	3.78	2.68
4		3.55	5.02	3.78	5.01	19	3.82			4.01	2.54
5		3.55	4.61	3.78	5.02	20		3.53		6.00	2.54
6		3.54	5.03	3.77	4.82	21		3.52		6.08	2.50
7		3.54	4.71	5.32	4.83	22	3.81	3.52		5.47	2.51
8		3.54	4.70	5.35	5.04	23	3.68	3.48	4.41	4.31	2.51
9		3.54	4.81	5.52	4.20	24	3.65	3.46	4.38	3.62	2.60
10		3.54	4.68	6.02	3.60	25	3.62	3.46	4.20	3.02	2.60
11		3.54	4.41	5.01	2.78	26	3.62	3.45	4.11	3.01	2.55
12		3.54	4.21	4.51	2.78	27	3.58	3.45	4.80		2.55
13		3.53	4.01	4.30	2.75	28	3.58	3.45			2.68
14		3.53	3.90	4.25	2.74	29	3.57	3.45	3.80		2.55
15			3.80	4.15	2.73	30	3.57	3.60	3.77		2.50
						31			3.76		2.50

SKOKOMISH RIVER BASIN.

GENERAL FEATURES.

Skokomish River is formed by the confluence of its North and South forks 7 miles above its mouth, which is located near Potlatch, Wash., at the great bend of the Hood Canal. The North Fork rises in a small lake on the summit of Mount Stone, flows southeastward to Lake Cushman, thence southward 14 miles to the junction of the forks. The total length of this stream is therefore 35 miles from the source of its longest fork to mouth. The South Fork rises on the summit of Mount Church and flows 22 miles in a southeasterly direction to the junction of the forks.

The basin comprises 232 square miles in the southeastern portion of the Olympic Peninsula in the northwestern corner of Mason County, Wash., and includes 17 miles of the Olympic divide, which ranges in altitude from 2,000 to 5,000 feet. About 170 square miles of this area is in the Olympic National Forest. Approximately 20 per cent of the total area is more than 4,000 feet above sea level and the vegetation is of the alpine type. Below the 4,000-foot level the soil is coarse glacial gravel, which supports a good stand of Douglas fir and hemlock. The underbrush and litter are thick and dense on the lower levels and grow thinner up slopes.

The North Fork of Skokomish River affords an unusually feasible and valuable power site. An excellent dam site is available in the narrow canyon at the outlet of Lake Cushman. This lake, which is 600 feet above sea level, has a surface area of 500 acres and would provide a good storage reservoir for a power plant in the canyon below.

During the winter months the greater part of this area is covered with snow 2 to 10 feet deep; the snow is often 15 to 30 feet deep on the highest peaks. Like other Puget Sound streams, the minimum stages are reached in September and February.

NORTH FORK OF SKOKOMISH RIVER NEAR HOODSPORT, WASH.

This station, which is located at the South Fork trail bridge over the North Fork at the head of Rocky Canyon, in NW. ¼ SE. ¼ sec. 5, T. 22 N., R. 4 W., about one-third mile southwest of a point on Lake Cushman road known locally as the Devil's Elbow, 5 miles below the lake and 10 miles above the junction of the forks, was established August 17, 1910, in cooperation with the United States Forest Service.

No important tributaries enter the North Fork between the lake and the forks.

The drainage area at the station comprises 94 square miles.

The gage is a vertical staff. The lower section, reading from 2 to 7.5 feet, is attached to a log on the left bank 25 feet downstream

from the bridge. The upper section, reading from 7.5 to 16 feet, is fastened to an alder tree on the bank.

Measurements are made by wading at low water and from the upstream side of the bridge at higher stages.

The channel is deep, with a gravel bottom and vertical rock walls.

The gage was washed out by a flood November 20, 1910, and was replaced at the same datum. The relation between gage height and discharge may at times be affected by backwater from log jams; but this effect did not occur during 1910. Conditions for measurement are by no means ideal, as the water is deep and flows in many eddies.

Discharge measurements of North Fork of Skokomish River near Hoodsport, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Ft.	*Sq. ft.*	*Ft.*	*Sec.-ft.*
Sept. 21[a]	H. P. Gilkey	53	65.7	6.5	156
Nov. 19	do	47	473	8.35	698

[a] Made by wading.

Daily gage height, in feet, of North Fork of Skokomish River near Hoodsport, Wash., for 1910.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1						16					
2						17	6.88	6.83			8.6
3					10.6	18					
4						19		6.83		8.35	
5		6.81				20					
6						21		6.50			
7						22		6.83			
8						23					
9		6.82				24					8.1
10					10.3	25		6.83			
11						26	6.80				
12		6.82				27					
13						28					
14						29	6.81				
15						30		6.88			
						31	6.80				

NISQUALLY RIVER BASIN.

GENERAL FEATURES.

Nisqually River drains a rather narrow area, comprising 675 square miles, lying on the western slope of the Cascade Range about 30 miles southeast of the city of Tacoma, between the Puyallup basin to the north and the Cowlitz basin to the south. The river proper, with its principal upper tributaries, Paradise and Kautz rivers, and Tahoma Fork, heads at the foot of Paradise, Nisqually, Kautz, and Tahoma glaciers, on the south side of Mount Rainier. It flows in southerly and westerly course from Nisqually Glacier for about 30 miles to a point near Alder, and thence northwestward through a very tortuous

channel to Case Inlet, the most southerly extension of Puget Sound, about 11 miles northeast of Olympia. Its total length is about 65 miles. In addition to the streams draining the glaciers, the principal tributaries are Mineral Creek and Little Nisqually River from the south, and Mashel, Ohop, and Muck creeks from the north. None of these lower tributaries are of great economic importance, as their minimum summer discharge is very low.

The topography of the area is that characteristic of glacial streams on the western side of the Cascades. Elevations range from 14,530 feet, at the summit of Mount Rainier, to sea level. The fall of Nisqually River is practically all concentrated in a distance of 35 miles between the foot of the glaciers, 4,000 to 6,000 feet in elevation, and Lagrande, where the elevation of the river is 500 feet. The main river in this section follows a high but rather uniform gradient to Alder, where it enters the Lagrande Canyon. Below Alder the stream has cut a narrow channel through the granite country rock and flows in numerous cascades to the mouth of the canyon 4 miles below, where the canyon walls rise vertically 400 feet above the water. Below Lagrande the grade decreases to tidewater in a distance of about 15 miles.

The entire area below the timber line, with the exception of small areas near the mouth which have been logged off, is densely covered with fir, hemlock, and cedar. The Mount Rainier National Park includes about 65 square miles and the Rainier National Forest about 120 square miles of the upper portion of the basin.

The rainfall over the basin is a little higher and somewhat more uniform than that contributed to drainage areas to the north lying east of the Olympic Range. This is due to the fact that the Olympic Range intercepts a portion of the moisture carried by the prevailing winds from the southwest which otherwise would fall in these areas. The rainfall on the lower parts of the basin ranges from 50 to 60 inches. Records kept at Ashford, near the park boundary, at an elevation of 1,780 feet above sea level, indicate an average annual precipitation of 70 inches. It seems probable that the mean annual precipitation on Mount Rainier exceeds 100 inches.

The flow of the river is fairly well maintained. The high-water period comes during the winter months, when the precipitation is greatest. During the summer months the precipitation is very low, but the melting of the glaciers acts as storage reservoirs. The absolute minimum for the year in the upper portion of the basin probably comes in January or February and is caused by the water freezing at the high altitudes.

No important amount of storage is available. Mineral and Ohop Lakes could be made to provide a small amount at a sufficient height for utilization for power development, but such utilization would doubtless prove rather expensive.

The city of Tacoma is building a municipal power plant which will divert water at the head of the canyon, carry it through a tunnel to an artificial equalizing reservoir at Lagrande, which will afford a head of 410 feet.

NISQUALLY RIVER NEAR ASHFORD, WASH.

This station, which is located about 7 miles east of Ashford, Wash., just back of the residence of Edward S. Hall, and one-half mile below the west boundary of Mount Rainier National Park, in the SW. ¼ sec. 33, T. 15 N., R. 7 E., was established October 28, 1910, to determine the amount of water available for water power at the boundary of the national park. Gage readings are furnished voluntarily by officers of the national park.

The nearest important tributaries are Big and Mineral creeks, entering about 7 and 12 miles below the station, respectively. No water is diverted above the station.

Gage heights are obtained by measuring down from a reference point of known elevation, using a rod which is graduated to give gage heights direct.

Low-water measurements may be made by wading in the vicinity of the gage. No equipment has been provided for high-water measurements.

The river at this point is very swift, and, as the winter climate is not very severe, gage heights will probably never be affected by ice. The river is occasionally used for running logs and shingle bolts and some trouble may be caused by backwater from jams on the riffle below the gage. The bed of the stream is composed of coarse gravel, and channel shifting is to be expected.

The high water of November 10, 1910, carried out the bridge on which the original reference point had been located, but the observer immediately established a new reference point at practically the same location. The relation between the observer's reference point and the original one was later established, and all gage heights have been reduced to the datum of the new reference point.

Gage-height observations are considered very reliable, and, with rather frequent discharge measurements aided by the installation of equipment for high-water measurements, will probably give excellent results. The station is not yet rated.

Discharge measurements of Nisqually River near Ashford, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 28	E. S. Fuller	62	93	4.70	370
Nov. 25	H. P. Gilkey	63	108	4.80	429

NOTE.—Made by wading.

Daily gage height, in feet, of Nisqually River near Ashford, Wash., for 1910.

[E. S. Hall observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	4.7	4.5	11	.....	5.0	4.5	21	.....	6.6	4.2
2	.....	4.7	4.8	12	.....	4.1	4.4	22	.....	5.9	4.2
3	.....	4.6	4.7	13	.....	3.9	4.3	23	.....	5.3	4.5
4	.....	4.7	4.6	14	.....	3.8	4.3	24	.....	5.0	4.5
5	.....	4.6	4.6	15	.....	3.8	4.2	25	.....	4.8	4.0
6	.....	4.8	4.6	16	.....	3.8	4.3	26	.....	4.7	4.4
7	.....	5.6	4.7	17	.....	3.7	4.2	27	.....	4.6	4.3
8	.....	6.6	4.7	18	.....	3.7	4.2	28	4.8	4.5	4.3
9	.....	6.3	4.6	19	.....	3.6	4.2	29	4.8	4.5	4.2
10	.....	7.3	4.5	20	.....	3.8	4.2	30	4.6	4.6	4.2
								31	4.6	.....	4.2

NISQUALLY RIVER BELOW LITTLE NISQUALLY RIVER, NEAR LA GRANDE, WASH.

This station, which is located at the site of the power house at La Grande, in sec. 32, T. 16 N., R. 4 E., was established September 5, 1906, by Frank C. Kelsey, civil engineer, at the headworks about 3 miles above La Grande, in sec. 9, T. 15 N., R. 4 E., and was maintained at this point by Mr. Kelsey and the city of Tacoma until September 9, 1910.

About January 1, 1910, a gage, reading elevations above sea level, was installed about 3 miles below the original gage and simultaneous readings were taken on the two gages.

No important tributaries enter between these two points. The nearest important tributaries below are Ohop and Tanwax creeks, which enter about 4 miles and 8 miles below La Grande, respectively.

Both gages are vertical staffs securely bolted to solid ledge.

After September 9, 1910, water was diverted around the upper gage to furnish temporary power, and the records at this gage were discontinued.

Discharge measurements up to 1909 were made from a footbridge at the upper gage. The measurement in 1910 was made at a temporary wagon bridge 200 feet below the upper gage, and the water diverted around the upper gage was measured in a flume. No equipment has been provided for discharge measurements at the lower gage.

The river at this point is subject to sudden floods during the fall and these floods have caused several shifts in channel. On one occasion the gage was washed out, but it was replaced at the original datum, which has been the same since the establishment of the station.

The relation between gage height and discharge is never affected by ice. The gage-height record is somewhat fragmentary, and there are periods of doubtful accuracy owing to lack of discharge measurements, but the record as a whole may be considered fairly reliable.

Discharge measurements of Nisqually River below Little Nisqually River, near La Grande, Wash., in 1906–1910.

[Upper gage.]

Date	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1906.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 11	W. P. Hardesty	48	168	2.65	319
14	do.	57	241	3.80	876
19	do.	51	220	3.24	648
1907.					
Sept. 29	A. Z. Richards	54	96	2.65	484
Oct. 9	do.	57	108	2.80	539
9	do.	57	102	2.71	479
9	do.	57	102	2.70	472
Nov. 16	do.	55	84	2.50	401
1908.					
Jan. 3	A. Z. Richards	82	297	5.05	1,700
1909.					
May 4	do.			6.10	2,390
6	do.			4.70	1,480
July 27	do.			3.23	738
Aug. 6	do.			2.90	665
21	do.			2.75	601
31	do.			3.05	714
Sept. 12	do.			2.25	466
20	do.			2.78	560
20	do.			2.76	555
22	do.			2.00	315
Oct. 4	do.			1.95	280
19	do.			2.13	335
24	do.			2.57	504
1910.					
Oct. 29	E. S. Fuller	40	217	[a] 3.05	609

[Lower gage.]

Oct. 29	E. S. Fuller			510.80	[b] 862

[a] Gage height may be slightly raised by backwater from construction work. Discharge does not include that diverted in canal.
[b] Discharge is sum of that at upper station and that of flume diverting past measuring section.

Daily gage height, in feet, of Nisqually River below Little Nisqually River, near La Grande, Wash., for 1906–1910.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1906.					1906.				
1		2.9	3.9	3.9	16	2.8	5.6		6.7
2		3.3	3.7	3.8	17	2.9	6.9		5.6
3		3.6	3.6	3.7	18	3.1	6.2		5.4
4		3.4	3.5	3.7	19	3.4	5.4		5.3
5	3.1	3.0	3.9	3.8	20	3.5	4.7		8.7
6	3.9	3.1	4.4	3.8	21	3.4	4.3		
7		3.0	6.2	10.0	22	3.5	3.9		9.3
8		2.9	8.0	7.8	23	3.6	3.7		9.1
9	2.9	3.3	7.5	7.0	24	3.5	3.4		8.7
10	2.8	3.4	7.9	6.2	25	3.4	3.0		7.0
11	2.6	3.2	7.4	6.0	26	2.8	7.5		6.7
12	2.9	3.5	8.2	5.6	27	3.1	6.2		6.0
13	3.0	3.2		5.4	28	3.3	5.2		5.7
14	3.4	4.0		5.4	29	2.8	4.7	4.2	5.7
15	3.2	3.5	19.1	4.9	30	2.8	4.5	4.1	
					31		4.2		

Daily gage height, in feet, of Nisqually River below Little Nisqually River, near La Grande, Wash., for 1906-1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.												
1	4.7	7.7	5.4	4.3	4.3	5.2	3.7	4.4	2.8	2.7	2.8	7.0
2	4.6	6.7	5.2	3.9	4.3	4.6	3.8	4.5	3.2	2.6	3.4	6.0
3	6.0	6.0	5.1	3.8	4.5	4.5	4.6	4.3	3.0	2.5	3.1	.....
4	7.7	6.0	4.7	4.0	4.5	4.6	4.6	3.6	3.2	2.6	2.8	.....
5	5.5	8.7	4.3	4.3	4.9	4.5	4.1	3.4	3.2	2.9	2.9	.....
6	5.6	11.0	4.2	4.7	4.9	4.2	3.8	3.4	3.4	3.1	2.9	.....
7	5.9	9.2	4.1	5.0	4.9	4.1	3.8	3.4	3.3	3.0	2.7	.....
8	4.9	9.0	4.0	5.6	4.8	3.8	3.9	3.2	3.4	2.8	2.6	.....
9	4.5	8.7	3.9	6.1	4.9	3.9	4.1	3.0	3.8	2.8	2.5	.....
10	4.4	8.0	3.8	8.1	4.9	4.0	4.0	2.9	3.8	2.9	2.6	.....
11	4.3	7.3	3.9	7.0	5.4	4.2	4.2	2.7	3.8	3.0	2.5	.....
12	4.2	6.7	3.7	6.3	5.1	4.2	4.1	2.7	3.1	3.0	2.5	.....
13	4.0	6.4	3.5	6.1	4.7	3.8	3.8	2.8	2.6	3.0	2.5	.....
14	3.4	5.7	3.6	6.0	4.4	3.4	3.7	2.9	2.4	2.9	2.5	.....
15	3.4	5.7	3.8	5.7	4.8	3.2	3.7	2.9	2.7	2.9	2.5	.....
16	3.4	5.5	3.7	5.7	5.6	3.3	3.7	3.1	4.0	2.7	2.4	.....
17	3.4	5.5	3.3	5.5	5.7	3.3	3.7	3.5	4.2	2.8	2.5	.....
18	3.3	5.4	3.5	5.3	5.4	3.6	3.6	3.1	3.6	2.9	2.4	.....
19	3.2	5.1	3.6	5.3	5.4	4.1	3.5	3.0	3.2	2.8	2.4	.....
20	3.6	5.4	3.4	5.5	4.9	4.0	3.9	3.2	3.0	3.0	3.3	.....
21	6.5	5.1	3.5	5.6	4.7	3.9	4.0	3.3	2.9	2.9	3.3	.....
22	6.2	5.3	3.5	5.1	4.5	3.5	3.7	3.3	2.8	2.8	5.3	.....
23	5.2	5.4	3.3	5.3	4.5	3.4	3.8	3.5	3.0	2.9	5.4	.....
24	5.0	5.7	3.0	5.1	4.3	3.7	3.7	4.0	3.2	3.0	7.2	.....
25	4.9	6.7	3.3	4.9	4.2	4.0	3.6	4.0	3.2	2.9	8.3	.....
26	4.7	6.1	3.3	4.7	4.4	4.3	3.4	3.3	3.0	2.8	9.3	.....
27	4.2	5.8	3.1	4.6	4.4	4.5	3.7	3.0	2.9	2.9	7.0	.....
28	4.4	5.3	3.1	4.4	4.5	4.5	3.6	2.8	2.8	2.7	6.3	.....
29	4.9	.....	3.2	4.3	4.7	4.1	4.0	2.9	2.6	2.7	9.0	.....
30	4.9	.....	3.0	4.3	4.8	4.2	4.0	3.0	2.7	2.9	8.0	.....
31	6.9	.....	3.6	.....	5.1	.....	4.4	2.7	.....	2.6	.....	.....

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1	.....	3.4	4.3	.....	5.7	5.3	.....	4.5	3.5	2.5	4.3	2.9
2	.....	3.3	4.2	4.2	5.9	.....	5.7	4.7	.....	.....	.....	.....
3	.....	3.1	.....	4.1	6.1	5.3	5.9	.....	3.3	2.5	4.5	2.5
4	.....	3.3	3.8	4.1	5.7	4.4	.....	4.2	3.1	.....	.....	.....
5	5.5	.....	.....	4.0	5.0	.....	5.8	4.1	.....	2.5	4.3	2.3
6	6.2	5.6	3.5	.....	.....	4.2	.....	.....	3.0	.....	.....	2.3
7	5.8	.....	3.4	3.9	4.7	4.3	6.0	3.9	.....	2.3	3.9	.....
8	.....	4.4	3.3	.....	.....	.....	6.3	3.8	2.9	.....	3.3	2.5
9	6.3	4.3	.....	3.7	4.4	6.0	.....	3.8	.....	2.2	.....	.....
10	5.6	3.8	3.2	3.6	4.3	.....	5.5	.....	2.8	.....	2.4	2.3
11	6.3	.....	3.3	3.5	4.2	6.3	5.4	3.6	3.3	2.3	.....	.....
12	5.5	3.7	.....	3.6	4.6	.....	5.3	.....	2.7	.....	2.3	2.5
13	5.2	3.5	5.9	3.5	.....	5.7	.....	3.5	.....	2.4	.....	6.3
14	5.0	.....	10.1	4.3	4.8	5.9	5.5	.....	2.5	.....	2.3	.....
15	4.8	3.8	10.4	.....	.....	5.8	.....	3.4	.....	4.3	2.5	4.2
16	4.7	4.8	.....	4.4	4.8	.....	5.3	3.7	2.7	.....	.....	.....
17	5.3	5.8	8.1	6.3	5.0	5.6	.....	3.8	.....	4.4	4.3	3.3
18	4.9	.....	.....	9.1	5.4	.....	4.7	.....	2.5	2.1	.....	.....
19	5.2	4.9	6.3	11.0	.....	5.8	5.1	3.7	2.7	.....	6.3	2.3
20	7.0	.....	.....	.....	5.2	.....	.....	.....	2.7	2.3	.....	2.3
21	6.3	4.3	5.3	7.4	5.3	4.5	4.9	3.6	.....	.....	5.7	.....
22	5.0	4.0	4.9	.....	5.2	4.3	.....	3.5	2.4	2.1	6.2	2.8
23	4.8	3.8	.....	6.3	5.0	.....	4.5	3.4	.....	.....	.....	.....
24	4.5	3.9	4.8	6.1	4.9	4.2	.....	.....	2.3	2.1	5.5	3.2
25	4.2	.....	.....	.....	.....	4.8	4.6	3.4	.....	2.2	.....	.....
26	4.1	4.7	4.8	6.2	4.7	.....	4.5	.....	2.3	.....	4.5	6.3
27	3.8	.....	4.9	5.3	.....	4.5	.....	3.3	.....	2.1	.....	8.1
28	3.6	4.9	4.7	5.3	4.9	4.4	4.3	.....	2.4	.....	3.5	.....
29	3.5	.....	4.6	4.9	5.0	.....	.....	3.3	.....	3.3	3.1	7.3
30	3.4	.....	4.5	.....	5.1	4.7	4.3	3.3	2.4	.....	.....	.....
31	3.4	.....	4.4	.....	5.1	.....	.....	.....	.....	4.2	.....	6.2

Daily gage height, in feet, of Nisqually River below Little Nisqually River, near La Grande, Wash., for 1906–1910—Continued.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.										
1	2.5	.....	.....	7.05	4.5	3.4	3.5	2.15	3.1	8.5
2	2.5	.....	.....	7.65	4.5	3.5	3.35	2.0	9.7	7.35
3	2.65	.....	.....	7.05	4.65	3.55	3.55	2.0	10.0	6.6
4	2.3	.....	.....	6.55	4.6	3.5	3.8	2.0	7.8	6.0
5	2.5	.....	.....	5.95	4.3	3.15	3.3	1.95	6.5	5.5
6	2.5	.....	.....	5.65	4.35	3.05	3.3	2.7	5.6	5.2
7	.....	.....	.....	5.45	4.6	3.15	3.4	2.5	4.95	4.95
8	.....	.....	.....	5.35	4.25	3.45	2.95	1.95	5.2	4.75
9	.....	.....	4.45	5.55	4.55	3.5	2.95	2.8	4.95	4.95
10	.....	.....	4.45	5.8	4.4	3.5	3.0	2.5	4.85	5.0
11	.....	.....	5.15	6.05	4.95	3.15	2.45	2.5	4.8	5.0
12	.....	.....	4.75	6.0	4.7	3.2	.....	2.6	4.4	8.4
13	.....	.....	4.65	5.45	3.95	3.25	2.5	2.1	4.3	8.0
14	.....	.....	4.45	5.25	4.10	3.35	2.65	2.0	3.95	6.9
15	.....	.....	4.4	5.35	4.35	2.95	2.8	2.05	3.7	6.25
16	.....	.....	4.4	5.35	4.4	2.85	.....	2.1	3.5	5.75
17	.....	.....	4.45	5.1	3.9	2.9	2.95	2.0	3.4	5.4
18	.....	.....	4.45	5.05	3.6	3.3	2.2	.....	7.0	5.0
19	.....	.....	4.45	5.05	3.5	3.6	2.1	2.15	10.7	.....
20	.....	.....	4.5	5.05	3.65	3.6	2.35	.....	9.4	4.6
21	.....	.....	4.3	4.85	3.75	3.0	2.4	2.4	8.1	4.45
22	.....	.....	4.15	4.7	4.1	2.8	2.05	2.2	9.0	4.2
23	3.9	.....	4.1	4.65	4.15	2.7	2.1	2.0	12.8	4.1
24	3.8	.....	4.25	4.45	4.15	2.7	2.25	2.6	12.2	4.05
25	.....	.....	4.6	4.45	3.9	2.7	2.4	2.2	8.8	.....
26	3.7	.....	5.15	4.45	3.65	3.65	2.2	2.15	7.6	.....
27	3.55	.....	6.15	4.90	3.40	3.50	2.25	2.1	6.7	.....
28	.....	.....	6.1	4.65	3.55	2.95	2.45	2.1	8.0	3.50
29	3.25	.....	5.85	4.45	3.75	3.10	2.55	2.2	11.0	3.40
30	3.35	.....	5.95	4.20	3.8	3.05	2.3	2.15	11.5	3.80
31	.....	.....	6.25	.....	3.8	3.15	.....	2.3	.....	4.70

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1910.									
1	4.1	5.8	9.2	4.5	.....	4.9	2.9	3.2	2.6
2	3.9	5.6	14.2	5.05	.....	4.35	3.0	3.2	2.6
3	3.5	5.1	10.5	4.9	.....	4.0	3.1	3.3	2.7
4	3.5	4.8	9.4	4.6	.....	4.9	3.1	3.0	2.6
5	3.4	4.6	7.8	4.7	.....	.....	3.1	3.2	2.5
6	3.35	4.45	7.3	4.9	.....	4.0	3.0	3.2	2.45
7	3.35	4.3	6.55	5.05	.....	4.1	3.1	3.4	2.3
8	3.3	4.1	6.05	5.9	4.65	3.9	3.3	3.6	2.2
9	3.3	3.95	5.8	6.2	4.8	3.85	3.6	3.5	.....
10	3.15	3.8	.....	5.9	6.4	4.45	3.8	3.2	.....
11	3.0	3.7	5.9	6.05	6.5	5.0	4.0	3.1	.....
12	3.0	3.7	6.45	6.15	6.2	4.7	3.9	3.1	.....
13	2.95	5.15	6.9	5.95	5.8	4.0	3.5	3.2	.....
14	2.9	4.75	7.2	5.55	6.0	3.8	3.4	3.0	.....
15	2.85	4.3	7.3	5.2	.....	3.7	3.4	2.8	.....
16	2.8	4.15	7.2	5.1	.....	3.8	3.35	2.6	.....
17	2.75	4.0	7.3	4.95	.....	3.6	3.1	2.75	.....
18	4.5	3.8	7.3	5.15	.....	3.2	3.1	3.0	.....
19	4.75	3.7	7.5	6.0	.....	3.4	3.1	3.1	.....
20	4.2	3.5	7.2	6.4	.....	3.5	3.4	3.25	.....
21	3.8	3.4	7.25	6.1	.....	3.2	3.4	3.0	.....
22	6.8	3.35	7.0	5.75	4.4	2.7	3.5	2.8	.....
23	8.4	4.5	6.8	6.1	5.2	2.7	3.0	2.75	.....
24	8.4	6.9	6.35	6.9	5.65	2.8	3.1	2.5	.....
25	7.6	7.3	5.9	7.25	5.4	2.9	3.0	2.55	.....
26	6.75	6.9	5.45	7.0	5.0	3.0	3.0	2.7	.....
27	6.0	7.2	5.2	6.2	4.4	3.0	3.0	2.7	.....
28	6.3	7.9	5.05	5.6	4.6	3.0	3.2	2.7	.....
29	5.7	.....	4.65	5.1	4.8	2.8	3.1	2.6	.....
30	5.7	.....	4.5	4.9	4.7	3.0	3.1	2.5	.....
31	5.75	.....	4.6	.....	4.8	.....	3.2	2.5	.....

Daily gage height, in feet, of Nisqually River at power-house site near La Grande, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	511.3	512.8	518.0	511.6	511.7	511.9	510.65	510.8	509.9	11.2	510.4	512.2
2	11.1	12.6	23.0	12.1	11.6	11.4	10.7	10.8	9.9	13.0	10.9	12.9
3	10.8	12.0	18.0	11.85	11.6	11.2	10.8	10.9	10.0	13.6	10.7	13.3
4	10.8	11.8	16.0	11.7	11.5	11.9	10.8	10.4	9.9	13.3	10.5	13.6
5	10.8	11.6	14.8	11.8	11.5	.....	10.8	10.4	9.75	12.6	10.4	13.3
6	10.75	11.5	14.3	11.95	11.5	11.2	10.6	10.4	9.65	11.9	11.0	13.5
7	10.75	11.4	13.4	12.1	11.3	11.3	10.7	10.5	9.5	11.8	14.7	13.4
8	10.7	11.3	13.0	12.8	11.6	11.1	10.9	10.6	9.4	11.9	13.6	13.8
9	10.7	11.2	12.8	12.8	12.6	11.0	11.0	10.65	9.5	11.85	12.8	13.7
10	10.6	11.1	12.6	13.0	13.3	11.6	11.1	10.4	9.6	11.55	21.6	13.7
11	10.5	11.0	.....	13.1	13.4	11.5	11.2	10.35	9.4	11.0	17.5	13.2
12	10.5	11.0	13.2	13.0	14.1	11.8	11.1	10.35	9.5	10.9	14.8	12.4
13	10.5	12.2	13.9	12.95	12.8	11.2	10.95	10.5	9.5	10.6	13.4	11.9
14	10.45	11.7	14.2	12.5	12.9	11.05	10.9	10.25	9.6	10.45	12.6	11.6
15	10.4	11.4	14.2	12.2	12.3	11.0	10.9	10.05	9.65	10.35	12.2	11.4
16	10.4	11.3	14.1	12.1	11.8	11.05	10.9	9.8	9.85	11.1	12.0	11.5
17	10.35	11.2	14.4	12.0	11.8	10.95	10.7	10.0	9.9	13.3	11.6	11.3
18	11.6	11.1	14.4	12.1	12.0	10.8	10.7	10.25	9.8	12.1	11.4	11.2
19	11.75	11.0	14.7	12.9	12.0	10.9	10.7	10.3	10.0	11.3	11.6	11.1
20	11.35	10.8	14.1	13.3	11.6	10.95	10.9	10.6	10.2	11.1	14.1	11.0
21	11.0	10.75	14.15	12.95	11.3	10.75	10.9	10.25	10.25	10.85	22.8	10.9
22	13.8	10.7	14.1	12.7	11.5	10.6	11.0	10.1	10.2	10.6	17.9	11.0
23	14.7	11.7	13.55	12.9	12.1	10.6	10.6	10.0	10.15	10.5	15.6	11.6
24	16.0	14.0	13.2	13.9	12.4	10.6	10.7	9.85	10.0	11.1	14.9	12.4
25	14.6	14.2	12.7	14.2	12.3	10.6	10.7	9.9	9.9	12.3	14.1	12.0
26	13.6	13.8	12.35	14.0	12.0	10.8	10.65	10.0	9.9	11.7	13.0	11.9
27	13.0	14.0	12.0	14.25	11.5	10.9	10.7	10.0	10.0	11.05	12.4	11.8
28	13.2	14.8	11.9	12.6	11.8	10.7	10.8	10.2	9.9	10.85	12.2	11.7
29	12.7	.....	11.7	12.15	12.6	10.55	10.7	9.8	10.1	10.7	12.1	11.6
30	12.7	.....	11.7	11.9	11.8	10.7	10.7	9.75	10.3	10.6	12.1	11.9
31	12.7	.....	11.6	.....	12.6	.....	10.75	9.75	.....	10.5	.....	11.7

Daily discharge, in second-feet, of Nisqually River below Little Nisqually River, near La Grande, Wash., for 1906–1910.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1906.					1906.				
1	.....	440	930	1,010	16	400	1,990	.....	2,840
2	.....	630	830	960	17	440	3,000	.....	2,030
3	.....	780	780	910	18	530	2,440	.....	1,890
4	.....	680	730	910	19	680	1,850	.....	1,820
5	530	480	930	960	20	730	1,400	.....	4,620
6	930	530	1,220	960	21	680	1,160	.....	4,920
7	770	480	2,440	5,920	22	730	930	.....	5,220
8	600	440	3,970	3,790	23	780	830	.....	5,020
9	440	630	3,520	3,080	24	730	680	.....	4,620
10	400	680	3,880	2,450	25	680	480	.....	3,080
11	320	580	3,430	2,310	26	400	3,520	.....	2,840
12	440	730	4,150	2,030	27	530	2,440	.....	2,310
13	480	580	.....	1,890	28	630	1,710	.....	2,100
14	680	980	.....	1,890	29	400	1,400	1,160	2,100
15	580	730	16,600	1,570	30	400	1,280	1,110	1,880
					31	.....	1,100	.....	1,660

Daily discharge, in second-feet, of Nisqually River below Little Nisqually River, near La Grande, Wash., for 1906–1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.												
1	1,450	3,700	1,890	1,210	1,210	1,750	910	1,270	500	470	500	3,080
2	1,390	2,840	1,750	1,010	1,210	1,390	960	1,330	660	440	760	2,310
3	2,310	2,310	1,690	960	1,330	1,330	1,390	1,210	580	410	620	.....
4	3,700	2,310	1,450	1,060	1,330	1,390	1,390	860	660	440	500	.....
5	1,960	4,620	1,210	1,210	1,570	1,330	1,110	760	660	540	540	.....
6	2,030	7,020	1,160	1,450	1,570	1,160	960	760	760	620	540	.....
7	2,240	5,120	1,110	1,630	1,570	1,110	960	760	710	580	470	.....
8	1,570	4,920	1,060	2,030	1,510	960	1,010	660	760	500	440	.....
9	1,330	4,620	1,010	2,380	1,570	1,010	1,110	580	960	500	410	.....
10	1,270	3,970	960	4,060	1,570	1,060	1,060	540	960	540	440	.....
11	1,210	3,340	1,010	3,080	1,890	1,160	1,160	470	960	580	410	.....
12	1,160	2,840	910	2,520	1,690	1,160	1,110	470	620	580	410	.....
13	1,060	2,600	810	2,380	1,450	960	960	500	440	580	410	.....
14	760	2,100	860	2,310	1,270	760	910	540	380	540	410	.....
15	760	2,100	960	2,100	1,510	660	910	540	470	540	410	.....
16	760	1,960	910	2,100	2,030	710	910	620	1,060	470	380	.....
17	760	1,960	710	1,960	2,100	710	910	810	1,160	500	410	.....
18	710	1,890	810	1,820	1,890	860	860	620	860	540	380	.....
19	660	1,690	860	1,820	1,890	1,110	810	580	660	500	380	.....
20	860	1,890	760	1,960	1,570	1,060	1,010	660	580	580	710	.....
21	2,680	1,690	810	2,030	1,450	1,010	1,060	710	540	540	710	.....
22	2,450	1,820	810	1,690	1,330	810	910	710	500	500	1,820	.....
23	1,750	1,890	710	1,820	1,330	760	960	810	580	540	1,890	.....
24	1,630	2,100	580	1,690	1,210	910	910	1,060	660	580	3,250	.....
25	1,570	2,840	710	1,570	1,160	1,060	860	1,060	660	540	4,240	.....
26	1,450	2,380	710	1,450	1,270	1,210	760	710	580	500	5,220	.....
27	1,160	2,170	620	1,390	1,270	1,330	910	580	540	540	3,080	.....
28	1,270	1,820	620	1,270	1,330	1,330	860	500	500	470	2,520	.....
29	1,570	.....	660	1,210	1,450	1,110	1,060	540	440	470	4,920	.....
30	1,570	.....	580	1,210	1,510	1,160	1,060	580	470	540	3,970	.....
31	3,000	.....	860	.....	1,690	.....	1,270	470	.....	440	.....	.....
1908.												
1	2,000	760	1,210	1,220	2,120	1,840	1,800	1,370	870	470	1,270	610
2	2,000	710	1,160	1,160	2,260	1,840	2,120	1,480	820	470	1,320	540
3	2,000	620	1,060	1,110	2,400	1,840	2,260	1,350	770	470	1,370	470
4	2,000	710	960	1,110	2,120	1,320	2,220	1,220	690	470	1,320	440
5	1,960	1,370	885	1,060	1,660	1,270	2,190	1,170	670	470	1,270	410
6	2,450	2,030	810	1,040	1,570	1,220	2,260	1,120	650	440	1,170	410
7	2,170	1,650	760	1,010	1,480	1,270	2,330	1,070	630	410	1,070	440
8	2,340	1,270	710	960	1,400	1,800	2,550	1,020	610	395	770	470
9	2,520	1,210	685	910	1,320	2,330	2,260	1,020	590	380	605	440
10	2,030	960	660	860	1,270	2,440	1,980	970	570	395	440	410
11	2,520	935	710	810	1,220	2,550	1,910	920	770	410	425	440
12	1,960	910	1,480	860	1,420	2,340	1,840	895	530	425	410	470
13	1,750	810	2,240	810	1,480	2,120	1,910	870	500	440	410	2,550
14	1,630	885	6,030	1,210	1,540	2,260	1,980	845	470	855	410	1,880
15	1,510	960	6,360	1,240	1,540	2,190	1,910	820	500	1,270	470	1,220
16	1,450	1,510	5,210	1,270	1,540	2,120	1,840	970	530	1,300	870	995
17	1,820	2,170	4,060	2,520	1,660	2,050	1,660	1,020	500	1,320	1,270	770
18	1,570	1,870	3,290	5,020	1,910	2,120	1,480	995	470	350	1,910	590
19	1,750	1,570	2,520	7,020	1,840	2,190	1,720	970	530	380	2,550	410
20	3,080	1,390	2,170	5,220	1,780	1,780	1,660	945	530	410	2,340	410
21	2,520	1,210	1,820	3,430	1,840	1,370	1,600	920	485	380	2,120	490
22	1,630	1,060	1,570	2,990	1,780	1,270	1,480	870	440	350	2,470	570
23	1,510	960	1,540	2,550	1,660	1,240	1,370	820	425	350	2,220	650
24	1,330	1,010	1,510	2,400	1,600	1,220	1,400	820	410	350	1,980	730
25	1,160	1,230	1,510	2,440	1,540	1,540	1,420	820	410	380	1,680	1,640
26	1,110	1,450	1,510	2,470	1,480	1,460	1,370	795	410	365	1,370	2,550
27	960	1,510	1,570	1,840	1,540	1,370	1,320	770	425	350	1,120	4,060
28	860	1,570	1,450	1,840	1,600	1,320	1,270	770	440	560	870	3,700
29	810	1,390	1,390	1,600	1,660	1,400	1,270	770	440	770	690	3,340
30	760	.....	1,330	1,860	1,720	1,480	1,270	770	440	995	650	2,900
31	760	.....	1,270	.....	1,720	.....	1,320	820	.....	1,220	.....	2,470

Daily discharge, in second-feet, of Nisqually River below Little Nisqually River, near La Grande, Wash., for 1906–1910—Continued.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.										
1	470	.....	.....	3,150	1,370	820	870	365	690	4,420
2	470	.....	.....	3,660	1,370	870	795	320	5,620	3,390
3	515	.....	.....	3,150	1,450	895	895	320	5,920	2,790
4	410	.....	.....	2,750	1,420	870	1,020	320	3,790	2,330
5	470	.....	.....	2,300	1,270	710	770	305	2,710	1,980
6	470	.....	.....	2,080	1,300	670	770	530	2,050	1,780
7	.....	.....	.....	1,940	1,420	710	820	470	1,630	1,630
8	.....	.....	.....	1,880	1,240	845	630	305	1,780	1,510
9	.....	.....	1,340	2,020	1,400	870	630	570	1,630	1,630
10	.....	.....	1,340	2,190	1,320	870	650	470	1,570	1,660
11	.....	.....	1,750	2,360	1,630	710	455	470	1,540	1,660
12	.....	.....	1,510	2,330	1,480	730	460	500	1,320	4,330
13	.....	.....	1,450	1,940	1,100	750	470	350	1,270	3,970
14	.....	.....	1,340	1,810	1,170	795	515	320	1,100	3,030
15	.....	.....	1,320	1,880	1,300	630	570	335	970	2,510
16	.....	.....	1,320	1,880	1,320	590	600	350	870	2,160
17	.....	.....	1,340	1,720	1,070	610	630	320	820	1,910
18	.....	.....	1,340	1,090	920	770	380	340	3,110	1,660
19	.....	.....	1,340	1,690	870	920	350	365	6,690	1,540
20	.....	.....	1,370	1,690	945	920	425	400	5,320	1,420
21	.....	.....	1,270	1,570	995	650	440	440	4,060	1,340
22	.....	.....	1,200	1,480	1,170	570	335	380	4,920	1,220
23	1,070	.....	1,170	1,450	1,200	530	350	320	9,000	1,170
24	1,020	.....	1,240	1,340	1,200	530	395	500	8,340	1,140
25	.....	.....	1,420	1,340	1,070	530	440	380	4,720	1,070
26	970	.....	1,750	1,340	945	945	380	365	3,610	1,000
27	895	.....	2,440	1,600	820	870	395	350	2,870	940
28	.....	.....	2,400	1,450	895	630	455	350	3,970	870
29	750	.....	2,220	1,340	995	690	485	380	7,020	820
30	795	.....	2,300	1,220	1,020	670	410	365	7,570	1,020
31	.....	.....	2,510	.....	1,020	710	.....	410	.....	1,480

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	1,170	2,190	5,120	1,370	1,440	1,600	610	730	500	1,100	642	1,790
2	1,070	2,050	10,600	1,690	1,370	1,300	650	730	500	2,360	910	2,280
3	870	1,720	6,470	1,600	1,370	1,120	690	770	530	2,840	785	2,600
4	870	1,540	5,320	1,420	1,300	1,600	690	650	500	2,600	682	2,840
5	820	1,420	3,790	1,480	1,300	1,360	690	730	470	2,070	642	2,600
6	795	1,340	3,350	1,600	1,300	1,120	650	730	455	1,580	975	2,760
7	790	1,270	2,750	1,690	1,170	1,170	690	820	410	1,510	3,720	2,680
8	770	1,170	2,360	2,260	1,450	1,070	770	920	380	1,580	2,840	3,000
9	770	1,100	2,190	2,470	1,540	1,040	920	870	402	1,540	2,210	2,920
10	710	1,020	2,220	2,260	2,630	1,340	1,020	730	424	1,340	9,470	2,920
11	650	970	2,260	2,360	2,710	1,660	1,120	690	382	975	5,980	2,520
12	650	970	2,670	2,440	2,470	1,480	1,070	690	402	910	3,800	1,930
13	630	1,750	3,030	2,300	2,190	1,120	870	730	402	730	2,680	1,580
14	610	1,510	3,270	2,020	2,330	1,020	820	650	424	662	2,070	1,370
15	590	1,270	3,350	1,780	1,860	970	820	570	435	624	1,790	1,240
16	570	1,200	3,270	1,720	1,510	1,020	795	500	479	1,040	1,650	1,300
17	550	1,120	3,350	1,630	1,510	920	690	550	490	2,600	1,370	1,170
18	1,370	1,020	3,350	1,750	1,650	730	690	650	468	1,720	1,240	1,100
19	1,510	970	3,520	2,330	1,650	820	690	690	514	1,170	1,370	1,040
20	1,220	870	3,270	2,630	1,370	870	820	750	572	1,040	3,240	975
21	1,020	820	3,310	2,400	1,170	730	820	650	589	878	10,500	910
22	2,950	795	3,110	2,160	1,320	530	870	570	572	730	6,320	975
23	4,330	1,370	2,950	2,400	1,780	530	650	550	557	682	4,440	1,370
24	4,330	3,030	2,590	3,030	2,080	570	690	470	514	1,040	3,880	1,930
25	3,610	3,350	2,260	3,310	1,910	610	650	485	490	1,860	3,240	1,650
26	2,910	3,030	1,940	3,110	1,660	650	650	530	490	1,440	2,360	1,580
27	2,330	3,270	1,780	2,470	1,320	650	650	530	514	1,010	1,930	1,510
28	2,550	3,880	1,690	2,050	1,420	650	730	530	490	878	1,790	1,440
29	2,120	.....	1,450	1,720	1,540	570	690	500	542	785	1,720	1,370
30	2,120	.....	1,370	1,600	1,480	650	690	470	606	730	1,720	1,580
31	2,160	.....	1,420	.....	1,540	.....	730	470	.....	682	.....	1,440

NOTE.—Daily discharge determined from rating curves applicable as follows: Sept. 5 to Nov. 15, 1906, fairly well defined between 300 and 4,000 second-feet; Nov. 29, 1906, to Apr. 19, 1908, well defined between 400 and 3,000 second-feet; Apr. 20, 1908, to Aug. 31, 1910, fairly well defined between 290 and 4,000 second-feet; Sept. 1 to Dec. 31, 1910, from a fairly well defined curve applied to readings on the gage at the power house,

Monthly discharge of Nisqually River below Little Nisqually River, near La Grande, Wash., for 1906–1910.

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1906.							
September 5–30	930	320	573	1.95	1.89	29,500	B.
October	3,520	440	1,150	3.91	4.51	70,700	B.
November 1–12	4,150	730	2,230	7.59	3.39	53,200	B.
December	5,920	910	2,570	8.74	10.08	158,000	B.
1907.							
January	3,000	660	1,550	5.27	6.08	95,300	B.
February	7,020	1,690	2,880	9.80	10.20	160,000	C.
March	1,890	580	954	3.24	3.74	58,700	B.
April	4,000	960	1,810	6.16	6.87	108,000	B.
May	2,000	1,160	1,510	5.14	5.93	92,800	B.
June	1,750	660	1,080	3.67	4.10	64,300	B.
July	1,390	760	1,000	3.40	3.92	61,500	B.
August	1,330	470	718	2.44	2.81	44,100	B.
September	1,160	380	662	2.25	2.51	39,400	B.
October	620	410	520	1.77	2.04	32,000	B.
November	5,220	380	1,370	4.66	5.20	81,500	B.
The period						838,000	
1908.							
January	3,080	760	1,740	5.92	6.82	107,000	B.
February	2,170	620	1,230	4.18	4.51	70,800	B.
March	6,360	660	1,920	6.53	7.53	118,000	B.
April	7,020	810	1,990	6.77	7.55	118,000	B.
May	2,400	1,220	1,670	5.68	6.55	103,000	B.
June	2,550	1,220	1,750	5.95	6.64	104,000	B.
July	2,550	1,270	1,770	6.02	6.94	109,000	B.
August	1,480	770	967	3.29	3.79	59,500	B.
September	870	410	551	1.87	2.09	32,800	B.
October	1,320	350	568	1.93	2.22	34,900	B.
November	2,550	410	1,230	4.18	4.66	73,200	B.
December	4,060	410	1,210	4.12	4.75	74,400	B.
The year	7,020	350	1,380	4.70	64.05	1,000,000	
1909.							
May 9–31	2,510	1,170	1,590	5.41	4.63	72,500	B.
June	3,660	1,220	1,940	6.60	7.36	115,000	B.
July	1,630	820	1,180	4.01	4.62	72,600	B.
August	945	530	738	2.51	2.89	45,400	B.
September	1,020	335	560	1.90	2.12	33,300	B.
October	570	305	386	1.31	1.51	23,700	B.
November	9,000	690	3,550	12.1	13.50	211,000	B.
December	4,420	820	1,920	6.53	7.53	118,000	B.
The period						692,600	
1910.							
January	4,330	550	1,530	5.20	6.00	94,100	B.
February	3,880	795	1,640	5.58	5.81	91,100	B.
March	10,600	1,370	3,210	10.9	12.57	197,000	B.
April	3,310	1,370	2,100	7.14	7.97	125,000	B.
May	2,710	1,170	1,660	5.65	6.51	102,000	B.
June	1,660	530	982	3.34	3.73	58,400	B.
July	1,120	610	761	2.59	2.99	46,700	B.
August	920	470	642	2.18	2.51	39,500	B.
September	606	380	483	1.66	1.85	29,000	B.
October	2,840	624	1,310	4.46	5.14	80,600	B.
November	10,500	642	2,870	9.76	10.89	171,000	B.
December	3,000	910	1,820	6.19	7.14	112,000	B.
The year	10,600	380	1,580	5.37	73.09	1,150,000	

NOTE.—These discharges were computed by the U. S. Geological Survey from data furnished by Mr. Frank C. Kelsey and the chief engineer of the Nisqually power plant and the city of Tacoma.

PUYALLUP RIVER BASIN.

GENERAL FEATURES.

Puyallup River heads at altitude about 4,000 feet above sea level at the foot of the North Tahoma and the Puyallup glaciers, which extend down the southwest slope of Mount Rainier, and flows northwestward 46 miles into Commencement Bay at Tacoma. The area comprises 470 square miles, extending northwest and southeast between the city of Tacoma and Mount Rainier, lies between White River basin to the north and the Nisqually River basin to the south, and is somewhat similar to those basins in general features.

The most important tributaries are Mowich and Carbon rivers.

Mowich River, which is larger than the river proper above the mouth of Mowich, heads in the North and South Mowich glaciers on the west side of Mount Rainier, and follows a westerly course for about 9 miles to its point of junction with the Puyallup, 8 miles from its source.

Carbon River flows from Carbon glacier, on the northwest slope of Mount Rainier, and flows northwestward 29 miles to its junction with Puyallup River about 2½ miles below the town of Orting. Stuck River, which enters near the town of Puyallup, delivers to the river water from the White River basin. (See p. 609.)

Elevations within the basin range from 14,530 feet, at the summit of Mount Rainier, to sea level at Tacoma. The upper portion of the basin is very rugged and irregular. The broad gravel flood plains filled with glacial débris noticeable on Puyallup and Mowich rivers indicate that the glaciers have receded within recent times from a point a short distance below the junction of the two, to their present stand. About 2 miles below the mouth of Mowich River, at an elevation of about 1,500 feet, the Puyallup enters a canyon similar to the one on Nisqually River at La Grande, the walls of which are not so steep at the lower end as are those on the Nisqually. Within the canyon for a distance of 8 miles the average gradient of the river is about 100 feet to the mile.

A heavy stand of fir, hemlock, and cedar covers the entire area below the timber line. The considerable portion of lowland area that has been logged off forms but a small percentage of the whole area. The Rainier National Forest includes 100 square miles and the Mount Rainier National Park 95 square miles of the drainage area.

The average precipitation over the area is probably less than that on basins immediately south and greater than that on the basins to the north, as it lies between the Olympic and Cascade ranges in a zone which marks the southern limit of the influence of the Olympic Range over meteorological conditions. The mean annual precipitation at Tacoma is 43 inches; at the mouth of Mowich, at an elevation of 1,600 feet above sea level, it is probably about the same as at Ash-

ford in the Nisqually basin. Records kept at that point indicate a mean annual precipitation of 70 inches. The amount of rain and snow falling upon the high altitudes in the Mount Rainier National Park is probably in the aggregate considerably in excess of 100 inches.

The minimum flow of the upper portion of the river usually occurs during the periods in which the supply at the headwaters freezes. The snowfall on the lower reaches of the basin is small and usually melts soon after falling, but snow 6, 8, or even 10 feet deep is not uncommon at elevations above 1,600 feet.

The only storage of consequence available for regulating the flow of Puyallup River is that to be had by raising the level of Lake Kapowsin. It seems probable that the development of power through the available head below the level of the lake would prove practicable if storage could be provided in this manner.

The Puget Sound Power Co. built a hydro-electric power plant on Puyallup River in 1902 and 1903. Water is diverted at a point about three-fourths mile below the mouth of Mowich River and is carried along the left side of the valley 10.2 miles in a flume to an artificial equalizing reservoir where a static head of 880 feet is obtained at the power house located at Electron.

CARBON RIVER AT FAIRFAX, WASH.

This station, which is located at the Northern Pacific Railway bridge in Fairfax, Wash., in sec. 26, T. 18 N., R. 6 E., about 3 miles below the boundary of the Rainier National Forest, and about 6 miles below the Mount Rainier National Park, was established November 23, 1910, in cooperation with the National Park Service.

The vertical staff gage is attached to a wing dam just above the bridge from which discharge measurements are made.

The following measurement was made by H. P. Gilkey:

November 23, 1910: Width, 124 feet; area, 283 square feet; gage height, 6.60 feet; discharge, 1,100 second-feet.

Daily gage height, in feet, of Carbon River at Fairfax, Wash., for 1910.

[Thos. O'Farrell, observer.]

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1			11			21		
2		6.0	12			22		5.6
3		6.0	13			23	6.6	5.6
4		6.1	14		5.6	24	6.4	5.85
5			15		5.8	25	6.2	6.0
6		6.0	16			26		
7		6.1	17			27	5.9	
8		6.2	18			28	5.7	5.8
9		6.0	19			29		5.7
10			20			30	5.8	5.7
						31		5.7

WHITE RIVER BASIN.

GENERAL FEATURES.

White River drains a triangular area embracing 488 square miles, the apex of this triangle extending toward the southern portion of Puget Sound, and the base, 25 miles long, following the Cascade Range between Mount Rainier and Pyramid Peak, which is located about 2 miles north of the Naches Pass. White River proper is formed by the junction of its East and West forks at a point 20 miles west and a little north of Mount Rainier. East Fork, which is the larger of the two, heads at the foot of White River glacier and flows north and west a total distance of about 22 miles; West Fork drains Winthrop Glacier and flows in a straight line toward the junction; below the forks the river pursues a general northwesterly course for 35 miles, makes a large detour to the south, passing through the old Stuck River channel, and emptying into Puyallup River about a mile above the town of Puyallup. Originally the river divided, a part of its water flowing through Stuck and the remainder to Duwamish River, but the channel to the Duwamish has been dammed, throwing the total flow into Puyallup River.

Greenwater River, which drains the western slope of the Cascade Range and flows into the main stream 2½ miles below the forks, is the only important tributary of White River above the Stuck-Duwamish Valley. Clearwater Creek, which enters the main stream from the south about 10 miles below the mouth of Greenwater River, is a small stream heading in the Bears Head Mountains.

White River is unlike the other rivers heading in Mount Rainier, in that there are no marked canyons along its course. The gradient is comparatively uniform and the valley wide throughout. There is a marked contrast between the rough mountainous upland and the rolling lowlands of the lower portion of the basin. The dividing line between these two sections crosses near the mouth of Greenwater River.

Elevations range from 14,530 feet, at the summit of Mount Rainier, to sea level. The portion of the Cascade Range drained by the Greenwater River reaches elevations between 5,500 and 6,000 feet.

A very fine stand of fir, hemlock, and cedar abounds all over the basin below the timber line. The areas located below the Rainier National Forest are held in private ownership and no doubt will eventually be logged off, but only a very small part of the timber has been cut at present. The Rainier National Forest includes 175 square miles and the Mount Rainier National Park 90 square miles of the drainage area.

The precipitation over the basin ranges from 35 to 40 inches on the lower course of the river to probably more than 100 inches at the summit of Mount Rainier and about 70 inches on the crest of the Cascades. The small amount of snow that falls in the lowland belt soon melts. In the higher altitudes above Greenwater River, however, about 75 per cent of the total precipitation consists of snow which piles up to depths of 4 to 10 feet from November to April, inclusive. Accordingly the minimum flow of the upper section of the river occurs during the cold periods in the winter when the snow and ice storage is at a maximum. The melting of this snow and ice causes the floods that occur in May and June. White River has one distinct advantage over the other rivers heading in Mount Rainier in the fact that the glaciers have a northern exposure and an auxiliary basin draining the Cascades. Since the rays of the sun do not strike these glaciers the maximum water supply coming from the melting of the ice comes after the Cascades have yielded practically all of the water from their ice and snow storage.

The Puget Sound Power Co. has recently completed the Lake Tapps project, which, with the present installation, develops 36,000 horsepower. The water is diverted from White River at a point about 1 mile above Buckley and carried by flume and canal through a chain of small lakes for a distance of 5.2 miles to Lake Tapps, where 46,000 acre-feet of storage is obtained by raising the natural surface of the lake 30 feet. The water is conducted from the lake to the power plant at Deringer by steel pressure pipes and a head of 440 feet realized. It is estimated that 30,000 horsepower may be developed by diverting water from the river about 3 miles below the mouth of Greenwater and carrying it by canal and pressure pipes 11 miles on the right side of the valley to a point where 650 feet working head may be obtained.

WHITE RIVER AT BUCKLEY, WASH.

This station, which is located at the Northern Pacific Railway bridge about three-fourths mile northeast of Buckley, was established April 22, 1899, discontinued August 31, 1903, and reestablished October 1, 1910.

The inclined staff gage is bolted to the concrete retaining wall on the left abutment of the channel span of the bridge.

The channel shifts and frequent measurements are necessary to obtain good results. Since the station was established the measurements have been made from the deck railroad bridge about 65 feet above the water.

No rating curve is yet available for 1910.

Discharge measurements of White River at Buckley, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 2	F. F. Henshaw	125	311	0.87	963
Nov. 22	H. P. Gilkey	238	680	2.55	5,250

Daily gage height, in feet, of White River at Buckley, Wash., for 1910.

[H. P. Anderson, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	1.3	0.9	1.1	11	1.3	2.75	1.25	21	0.8	3.15	0.7
2	1.0	.8	1.2	12	1.2	2.1	1.0	22	.8	2.5	.7
3	2.3	.95	1.3	13	1.0	1.7	1.0	23	.8	2.2	1.05
4	2.15	.9	1.25	14	1.0	1.5	.95	24	.9	1.9	1.3
5	1.9	.8	1.25	15	.9	1.35	.95	25	1.95	1.7	1.2
6	1.3	1.05	1.3	16	.9	1.1	.9	26	1.6	1.5	1.05
7	1.8	1.5	1.45	17	1.2	1.0	.8	27	1.1	1.3	1.1
8	1.5	1.5	1.5	18	1.2	1.0	.75	28	1.0	1.2	1.0
9	1.6	1.5	1.4	19	1.05	.95	.75	29	.9	1.2	1.0
10	1.45	3.45	1.3	20	.9	1.45	.7	30	1.0	1.3	1.1
								31	.9	.....	1.05

CEDAR RIVER BASIN.

GENERAL FEATURES.

Cedar River heads in Yakima Pass at an elevation of 2,500 feet and flows west and a little north 45 miles to its junction with Lake Washington. The basin is long and narrow, extending northeast and southwest from the southern end of Lake Washington near Seattle to the Cascade Range, and comprises 240 square miles. Cedar Lake, which covers an area of 1,200 acres, lies 1,530 feet above sea level and is 12 miles from the source of the river. Rex River, a stream 8 miles long, the only important tributary, enters Cedar Lake from the southeast.

Evidences of glaciation are very marked in the upper portion of the basin; remains of terminal moraines are still noticeable below the outlet of Cedar Lake. The elevations of the peaks along the main ridge of the Cascades range from 5,300 to 5,400 feet. The mountain sides are very steep and several of the small feeders at the headwaters rise in glacial cirques.

At a point about 2 miles below Cedar Lake the river takes a very steep gradient over a number of cascades and through a narrow V-shaped valley. Within 3 miles in this section of the river the fall averages nearly 200 feet to the mile. Of this fall 600 feet is made use of by the Seattle municipal power plant, which takes water through an 18-foot timber dam and carries it on the right side of the valley by wood-stave pipe lines and steel-pressure pipes to the plant located near Moncton. The topography in the vicinity of

Moncton is such that it appears likely that Cedar River at one time was tributary to the South Fork of Snoqualmie River. The bed of the river a short distance below Moncton is only a few feet lower than the divide separating the two basins.

The entire basin below the timber line is well covered with fir, hemlock, and cedar. The city of Seattle has acquired 117 square miles of land within the basin by condemnation, by actual purchase, and from the Forest Service for the purpose of insuring the continued purity of water and uniformity of flow for the gravity water-supply system.

The precipitation on the Cedar River basin ranges from a mean annual of 36 inches at Seattle to about 70 inches at the crest of the mountainous area. Records kept at the intake of the municipal pipe lines, elevation 535 feet, give an average of 56 inches for the 2 years, 1909 and 1910. Between 85 and 90 per cent of this amount is contributed during the 8 months, October to May, inclusive. Perhaps 70 per cent of the precipitation occurs, as snow which remains on the ground throughout the winter above the level of Cedar Lake. The melting of this snow in the spring occasions the floods at that season of the year. During August and September the water supply is derived almost entirely from the ground water storage, so that a very low minimum flow obtains. A minimum of 0.65 second-foot per square mile was recorded in September, 1902. This is exceptionally low for the Puget Sound basin. The years 1897 and 1899 appear to have been years of high run-off, and 1905 and 1907 years of low run-off.

Cedar Lake offers excellent opportunities for storing water for regulating the flow of the river. The storage obtained by the temporary timber dam is 16,900 acre feet. The possibility of raising the lake level to 60 feet above the original elevation is being investigated. If that scheme proves feasible, 111,000 acre-feet of storage can be provided.

CEDAR RIVER NEAR RAVENSDALE, WASH.

This station, which is located at the intake of the pipe line which furnishes water to the city of Seattle, 15 miles below Cedar Lake and 3 miles north of Ravensdale, was established September 27, 1902.

The data obtained at this station are of great value, as they are continuous and reliable and constitute the only stream-flow data for any long period on the western slope of the Cascade Range in Washington.

The flow is obtained from the formula $Q = 3.75LH + 50$. The gage heights represent the head of water (H) on the crest of the dam. The length of the crest (L) is 120 feet. It is steel shod, of triangular section. The upstream slope forms an angle of 30 degrees with the

horizontal and the downstream slope an angle of 60 degrees. For this dam a mean of the coefficient obtained from the current-meter measurements made from 1902 to 1906 gives a value of $c=3.76$, while the mean obtained from a set of weir experiments for a dam of similar type is approximately 3.73. (See Water-Supply Paper 200, Pl. X, series 140.) In computing the rating table "c" has been given the value of 3.75. The quantity 35 was formerly added as the amount diverted into the pipe line. This diversion varies within small limits, but 35 second-feet has been used to the end of 1909 in computing the run-off for this area. A second pipe, with a capacity of about 70 second-feet was put in service about October, 1909, and since that time the diversion has been about 50 second-feet.[1] The datum of the gage was set to coincide with the crest of the dam at an elevation of 436 feet above sea level. The gage had not been checked for several years until April, 1911, when it was found to read 0.11 foot too high. It is not known when the change occurred, but it has been assumed to have been in this condition throughout 1910. The results for 1909, 1910, and probably a little earlier, are therefore uncertain and subject to revision, and are held for further study.

SKYKOMISH RIVER BASIN.

GENERAL FEATURES.

Skykomish River drains the west slope of the Cascade Mountains for a distance of 30 miles, as measured along the divide, and 22 miles, in a straight line northward between the point common to King, Kittitas, and Chelan counties, along the eastern boundary of King and Snohomis counties to a point 1 mile south of Indian Pass, where it touches the Sauk River drainage basin.

Skykomish River proper is formed by the junction of its North and South forks near the town of Index and the southern boundary of Snohomish County, Wash. The most important tributaries of the North Fork are Trout, Troublesome, Gobble, and Cady creeks. The South Fork is formed by the junction of Beckler and Tye rivers near the town of Skykomish, the most important tributaries below being Miller Creek and Money Creek, which enter from the south near the town of Berlin, Wash. Below Index, at the junction of the forks, Sultan River is the main tributary. It enters from the north and flows into the Skykomish at Sultan, Wash. Ten miles below Sultan the Skykomish unites with the Snoqualmie to form the Snohomish River.[2]

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[1] For a description of the measurement of the amount diverted, see Trans. Am. Soc. Civil Eng., vol. 49, p. 112.

[2] The area drained by the forks of the Skykomish, from the divide westward within a few miles of Index and the junction, is shown on the map of the Skykomish quadrangle, published by the U. S. Geol. Survey.

Above the junction of the North and South forks this drainage area is located within the Snoqualmie National Forest in King and Snohomish counties, Wash., except a strip about 1 mile wide along the bed of the South Fork, which is privately owned.

The topography is very rugged. The mountains are 5,000 and 6,000 feet high with barren tops. In the valleys and on the lower slopes is a good stand of Douglas fir, hemlock, and cedar, which grows thinner up the slopes and is entirely absent on the mountain tops. The soil in the valleys is a loose glacial gravel, with banks of blue clay and a few pockets of loam. The soil is thin on the slopes and entirely absent on the higher elevations.

During the winter months the basin is covered with snow 2 to 10 feet deep. At the headwaters, over the greater part of the higher slopes, the snow remains until May or June, and on the higher peaks never entirely disappears. The stream reaches its lowest stage in September, when freezing begins in the higher parts of the basin, and before the fall rains begin. Another low period is in February, when the stream is ice locked and all precipitation is held back in the form of snow.

There are many power sites on the forks of the Skykomish above Index. The low-water flow is augmented by the natural storage furnished by many small lakes at the headwaters and by the glacial and everlasting snow in which the stream has its source. It is probable that this flow can be further conserved by artificial storage.

SOUTH FORK OF SKYKOMISH RIVER NEAR BERLIN, WASH.

This station, which is located at the county bridge in sec. 20, T. 26 N., R. 11 E., 1 mile below the Great Northern Railway station at Berlin, and 1¼ miles below the mouth of Miller River, an important tributary from the south, was established September 27, 1910, in cooperation with the United States Forest Service.

Discharge measurements are made from the county bridge, 200 feet above the railroad bridge to which the vertical staff gage is attached.

The gage height records are fragmentary, and sufficient measurements have not yet been obtained to define a rating curve for the station.

Discharge measurements of South Fork of Skykomish River near Berlin, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 27[a]	H. P. Gilkey	87	172	2.95	310
Nov. 16	do	233	707	5.10	1,670
Dec. 15	do	230	603	4.45	1,020

[a] Measurement made by wading.

Daily gage height, in feet, of South Fork of Skykomish River near Berlin, Wash., for 1910.

[A. G. Jackson, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1		4.7		11				21			
2	5.2		5.4	12	4.9	6.4	4.7	22			
3				13		6.0		23			
4				14				24		6.6	
5				15			4.45	25			
6				16		5.1		26			
7				17				27			
8		6.6		18				28			
9				19				29			
10				20				30	4.8		
								31			

SKYKOMISH RIVER AT SULTAN, WASH.

This station, which is located at the county bridge opposite the railroad station at Sultan, one-fourth mile above the mouth of Sultan River, in sec. 5, T. 27 N., R. 8 E., was established September 26, 1910.

The vertical staff gage is fastened to the crib work 50 feet above the highway bridge from which discharge measurements are made. Its datum has remained unchanged.

Sufficient measurements have not yet been obtained to define a rating curve for the station.

Discharge measurements of Skykomish River at Sultan, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft*
Sept. 26[a]	H. P. Gilkey	175	296	3.45	624
Nov. 15	do	249	1,810	6.55	4,060
Dec. 15	do	243	1,610	5.40	2,430

[a] Measurement made by wading ¼ mile above station.

Daily gage height, in feet, of Skykomish River at Sultan, Wash., for 1910.

[E. Merrifield, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		8.0	5.8	6.8	16		5.0	6.2	5.4
2		6.5	5.6	6.5	17		8.0	6.0	5.2
3		11.9	6.6	6.7	18		7.8	5.8	5.7
4		9.5	6.2	6.4	19		7.9	5.9	5.2
5		9.0	5.8	6.5	20		6.2	9.0	5.1
6		8.1	8.4	7.0	21		5.9	12.0	5.7
7		9.7	10.9	6.9	22		5.6	10.0	5.4
8		9.5	8.8	6.7	23		5.5	9.9	8.0
9		7.9	7.6	6.6	24		6.8	8.3	9.8
10		7.3	11.0	6.3	25		8.9	7.5	7.8
11		6.7	9.8	5.9	26	3.45	7.5	7.1	6.7
12		6.2	8.9	5.9	27	3.45	6.7	6.7	6.6
13		5.9	7.7	5.8	28	3.45	6.1	6.5	6.3
14		5.5	7.0	5.7	29	3.5	5.9	6.1	6.2
15		5.4	6.7	5.3	30	4.95	5.45	6.0	6.5
					31		5.6		10.0

NORTH FORK OF SKYKOMISH RIVER AT INDEX, WASH.

This station, which is located at Index, in sec. 17, T. 27 N., R. 10 E., 1 mile above the mouth of the river, and below all tributaries, was established August 24, 1910, in cooperation with the United States Forest Service.

The original gage, set August 24, 1910, was on the left bank 100 feet above the tramway bridge at Index. This was moved on October 26, 1910, to its present position on the wing dam 300 yards above the railroad bridge and 100 yards above the cable from which discharge measurements are made.

The station has not been rated, but conditions are favorable for good results.

Discharge measurements of North Fork of Skykomish River at Index, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 24[a]	H. P. Gilkey	116	192	1.39	279
Sept. 27[a]	do	94	111	.20	168
Oct. 26	Kimble & Gilkey	110	423	3.35	1,710
Nov. 17	H. P. Gilkey	113	249	2.68	805
Dec. 15	do	105	232	2.52	624

[a] Measurement made by wading 200 yards above the wagon bridge.

Daily gage height, in feet, of North Fork of Skykomish River at Index, Wash., for 1910.

[Lee Pickett, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.36		2.6	2.8	16				2.5	2.6
2		1.36		2.6	3.4	17				2.5	2.6
3				3.1	3.4	18				2.4	2.4
4				2.9	3.1	19				2.5	2.4
5				2.6	3.2	20				5.2	2.4
6				3.4	3.4	21				9.7	2.4
7				5.5	3.4	22				5.5	2.4
8				4.0	3.3	23				4.8	3.9
9				3.5	3.2	24	1.38			4.0	4.4
10				7.5	3.0	25	1.36			3.6	3.6
11				5.0	2.8	26	1.34		3.4	3.3	3.3
12				4.0	2.8	27	1.32	0.2	3.1	3.1	3.2
13				3.5	2.8	28	1.32		2.9	3.0	3.1
14				3.1	2.8	29	1.32		2.8	2.9	3.0
15				2.9	2.6	30	1.32		2.6	2.8	3.2
						31	1.34		2.5		2.9

STILLAGUAMISH RIVER BASIN.

GENERAL FEATURES.

Stillaguamish River is formed by the junction of its North and South forks near the town of Arlington, Snohomish County, Wash., and flows into Puget Sound near the town of Florence, 12 miles below the forks.

The principal tributary below the forks is Pilchuck River, which enters from the north about 7 miles above the mouth of the river. The most important tributary of the North Fork is Deer Creek, which enters from the north near Oso, Wash. Another tributary of the North Fork is Squire Creek, which heads in the glaciers on Whitehorse Mountain. The principal tributaries of the South Fork are Palmer Creek, which heads in Barlow Pass, and Canyon Creek. These tributaries enter the South Fork at distances of 40 and 8 miles, respectively, above Arlington.

The basin above the forks of the stream is rugged, and the mountain slopes are steep and rocky. The soil is made up largely of coarse gravel. A large part of the area between the forks has been stripped by forest fires and here the soil has been entirely washed away in places, leaving the rocks exposed. The area not burned over has a good stand of Douglas fir and hemlock.

There are several mountain peaks about 6,000 feet high in this area and on these mountains are glaciers which form the highest and most permanent water supply of the Stillaguamish. The river has, however, no feeders heading in the high divide of the Cascade Range, and its drainage area, therefore, differs from the adjacent areas of Sauk and Skykomish rivers in having much less high snow-covered area from which to draw its supply. It is probable, therefore, that the low stages of flow will be reached earlier in the summer than on the adjacent river courses

The South Fork of this stream offers very favorable conditions for power development in the canyon below Robe, Wash. It is also probable that stored waters could be impounded in a reservoir located directly above Robe. The canyon between Robe and Granite Falls offers many excellent dam sites.

SOUTH FORK OF STILLAGUAMISH RIVER NEAR SILVERTON, WASH.

This station, which is located at the Silverton ranger station, in SE. ¼ sec. 28, T. 30 N., R. 9 E., 5 miles by railroad above Gold Basin, Wash., one-half mile below Martin Creek, and one-fourth mile above Blackjack Creek, was established September 1, 1910, in cooperation with the United States Forest Service.

Measurements are made at low water by wading above the gage, which is a vertical staff spiked to a hemlock tree on the right bank, one-eighth mile above the ranger station. The datum of the gage has remained unchanged.

The channel seems to shift in extreme high water.

The following measurement was made by H. P. Gilkey by wading:

September 1, 1910: Width, 56 feet; area, 67 square feet; gage height, 1.02 feet; discharge, 63 second-feet.

Daily gage height, in feet, of South Fork of Stillaguamish River near Silverton, Wash., for 1910.

[Geo. Sawyer, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	1.0	.....	1.9	1.7	16	1.0	2.0	1.8	1.6
2	1.0	2.5	2.9	1.8	17	1.1	2.0	1.7	1.7
3	1.0	6.0	2.3	1.6	18	1.1	3.5	1.6	1.7
4	1.0	4.1	2.0	2.2	19	1.0	2.1	2.1	1.6
5	1.0	3.3	3.1	2.6	20	1.0	1.9	7.0	1.8
6	1.0	3.0	3.0	2.4	21	1.0	1.7	4.4	1.8
7	1.0	1.5	3.9	2.5	22	1.0	1.7	2.8	3.0
8	1.0	1.6	2.6	2.5	23	1.0	1.6	2.6	4.8
9	1.0	1.3	5.0	2.3	24	1.1	3.2	2.2	4.2
10	1.0	1.3	4.8	2.0	25	1.1	3.0	2.0	.....
11	1.0	1.5	2.8	1.6	26	1.1	2.1	1.8	.....
12	.9	2.1	2.4	1.5	27	1.1	2.0	1.7	.....
13	.9	2.0	2.1	1.5	28	1.1	1.8	1.6	.....
14	.9	2.5	1.9	1.4	29	1.3	1.7	1.5	.....
15	.9	2.5	1.8	1.6	30	1.5	1.6	1.7	.....
					31	.....	1.7	.....	.....

SKAGIT RIVER BASIN.

GENERAL FEATURES.

Skagit River, the largest stream tributary to Puget Sound, rises in Beaver Lake, British Columbia, 20 miles north of the Canadian line, and flows southwesterly 125 miles to its mouth near Mount Vernon, Skagit County, Wash. Below Mount Vernon it passes, by several channels, through its delta into Skagit Bay, an arm of the Sound.

Its basin comprises 3,100 square miles on the western slope of the Cascade Mountains, touching the crest for a distance of 130 miles, measured along the divide, or 90 miles in a straight line, extending from Indian Pass northward along the eastern boundaries of Snohomish, Skagit, and Whatcom counties to the Canadian line, thence northward 20 miles into British Columbia, where it reaches Fraser River basin.

Altitudes within this area range from sea level to about 7,000 feet on the Cascade divide and to more than 11,000 feet at the summit of Mount Baker—the highest peak in this basin. Other mountains whose slopes are drained by the Skagit are Glacier Peak and Mount Shuksan. Roughly speaking, the greater part of this area which is above an altitude of 1,000 feet—approximately 2,500 square miles—is in the Washington and Snoqualmie national forests. Above the timber line and within the zone of perpetual snow much of the surface is barren rock. On Mount Baker and Glacier Peak are many glaciers which furnish the most permanent water supply of the river. Below elevation of about 4,000 feet the area is, in general, timbered with Douglas fir and hemlock, which are smaller and less abundant with increase in altitude. Some of the heaviest stands of Douglas fir are found on the lower stretches of this area. Cedar is also abundant.

The prevailing soil found on the higher elevations is coarse glacial gravel, but there are many pockets of loam in the valleys, and the deposits of limestone and clay found at the mouth of Baker River are notable, as they furnish materials for the Portland cement manufactories there. Underbrush and litter are thick on the lower levels and along the stream courses, grows thinner up the slopes, and have disappeared before the timber line is reached.

The greater part of this area is snow covered to a depth of 2 to 10 feet in the winter months and to much greater depths on the higher slopes and peaks. As on all streams in the Puget Sound region, the minimum stages of the streams are reached in September and October, when freezing nights cut off the snow water from the higher slopes and the drought still prevails in the valleys and low areas. A second low stage comes in February, when the streams in the higher courses are ice locked and when all precipitation is held back in the form of snow.

The possibilities of the upper Skagit and its tributaries for power development are extensive, but few of the many feasible power sites have been utilized.

Navigation on the lower Skagit, from its mouth to Rockport, about 50 miles, has been investigated and reported on by the United States Army Engineers.

The two most important tributaries of Skagit River are Sauk and Baker rivers. Thunder Creek, Ruby Creek, and Cascade River are also very important, as they head in the high Cascade divide and furnish the water for the largest power plant now in operation.

Sauk River, the largest of the tributaries, drains an area comprising 731 square miles, mostly in the northeastern part of Snohomish County. Sauk River proper is formed by the union of the Upper Sauk and Suiattle rivers near the southern boundary of Skagit County, 10 miles above the mouth of the Sauk and the town of Sauk, Wash. Sauk River above the Suiattle is formed by the confluence of its north and south forks, Whitechuck River and Clear Creek, and it enters the Skagit approximately at the head of navigation near the town of Rockport. From its mouth to its most distant source at Indian Pass the river is about 50 miles long. The principal tributaries are received at distances from the mouth as follows: Suitattle, 10 miles; Clear Creek, 22 miles; the Whitechuck, 28 miles; and the confluence of North and South forks of Sauk, 35 miles. The Suiattle is composed of four streams almost equal in size—Canyon, Sulphur, Downey, and Buck creeks—entering at distances above its mouth of 30, 24, 22, and 16 miles, respectively. The tributaries head in the glaciers of the Cascade divide and carry all the water yielded by the ice fields of Glacier Peak. Altitudes within the basin exceed 6,000 feet in many places, including the

Cascade divide and the many lesser divides. Glacier Peak, 10,436 feet above sea level, is the highest peak in this area. A large part of the basin is above the timber line and much is in the zone of perpetual ice and snow. The greater part of the area drained by the Sauk above the mouth of the Suiattle is in the Snoqualmie and Washington national forests.

Baker River, the tributary second in importance, heads at Hannegan Pass on the eastern slope of Mount Shuksan and flows southward about 25 miles, passing through Baker Lake, on the southeastern slope of Mount Baker, to its junction with the Skagit, 40 miles above the mouth of that river, at Concrete, Wash. The basin of this stream comprises 295 square miles, is very mountainous and rugged, is chiefly in Whatcom County, and within the Washington National Forest. Like the Sauk, this river drains much surface within the zone of perpetual ice and snow, and is fed by the glacial fields of Mounts Baker and Shuksan.

Baker River offers possibly the most feasible power site in the whole Skagit basin, as indicated by the fact that it has already been developed. The Portland cement plants at Concrete have been operated by steam since the dam built on Baker River washed out in the fall of 1906.

Little can be added concerning Cascade River, which constitutes the third most important tributary of the Skagit. This river and the adjacent creeks, already named, are very desirable power streams. They are to be utilized by plants now under construction at Marblemount, Wash.

SKAGIT RIVER NEAR MARBLEMOUNT, WASH.

This station, which is located 800 feet above the point known as the "Corner," at the mouth of the canyon, about 1 mile above the mouth of Goodell Creek and about 26 miles above Rockport, the nearest railway station, was established December 21, 1908, and is maintained in cooperation with the Skagit Power Co.

Several gages, all at the same datum, have been used since the station was established. The present gage is a vertical staff in a well on the right bank under the cable and is connected with the water by a ditch 10 feet long.

The banks of the stream are high and rocky and will not overflow. The bed is composed of granite bowlders and is very rough, although in the immediate section where measurements are made the river flows quite smoothly. The channel is subject to some shifting in extreme floods.

Measurements are made from a cable and car.

The following measurement was made by H. P. Gilkey:

December 29, 1910: Width, 178 feet; area, 913 square feet; gage height, 2.64 feet; discharge, 2,390 second-feet.

Daily gage height, in feet, of Skagit River near Marblemount, Wash., for 1910.

[Skagit Power Co., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.13	2.94	1.97	3.82	6.46	8.71	6.34	4.60	2.53	4.51	3.71	3.61
2	2.02	2.67	2.56	3.62	6.29	7.94	6.41	4.15	2.59	3.05	3.65	3.84
3	1.95	2.58	3.13	3.55	6.24	7.01	6.39	4.24	2.73	4.70	3.57	3.75
4	1.90	2.44	3.30	3.45	6.46	6.75	6.34	4.51	2.68	3.64	3.36	3.69
5	1.86	2.37	3.22	3.95	6.89	7.39	6.35	4.34	2.61	3.73	3.26	3.63
6	1.81	2.30	2.84	4.30	7.90	7.99	6.36	4.35	2.43	6.81	4.07	3.61
7	1.82	2.22	2.69	4.16	9.09	7.55	6.54	4.51	2.43	7.29	6.30	3.61
8	1.81	2.13	2.52	4.09	9.94	6.95	6.87	5.10	2.20	6.66	5.94	3.54
9	1.76	2.06	2.39	4.16	9.90	6.91	6.97	5.21	2.04	7.35	5.24	3.49
10	1.70	2.03	2.36	4.11	11.85	7.70	7.31	5.00	1.97	5.83	7.70	3.34
11	1.70	1.97	2.46	4.15	11.45	10.00	7.74	4.80	1.86	4.97	7.35	3.15
12	1.66	1.89	2.67	4.36	10.51	9.36	7.83	4.35	1.79	4.41	6.35	3.05
13	1.61	1.94	3.07	4.47	9.60	7.80	7.31	4.15	1.76	3.96	5.61	2.96
14	1.60	1.86	3.55	4.30	8.70	7.31	6.75	4.10	1.83	3.72	5.04	2.84
15	1.54	1.79	4.08	4.18	7.75	7.24	6.56	3.61	1.97	4.00	4.58	2.76
16	1.51	1.68	4.59	4.29	7.31	7.41	6.67	3.40	2.27	4.15	4.23	2.69
17	1.51	1.60	5.08	4.57	7.59	6.94	6.46	3.46	2.86	5.70	3.95	2.63
18	1.76	1.60	5.39	4.94	8.59	6.64	5.92	3.52	2.55	4.95	3.81	2.53
19	1.64	1.60	5.70	6.15	8.35	6.23	5.69	3.76	2.70	4.25	3.61	2.50
20	1.51	1.60	6.09	6.95	7.70	6.15	5.79	3.93	3.15	3.86	4.61	2.55
21	1.58	1.47	6.39	6.85	7.65	5.88	6.15	3.60	3.40	3.54	10.30	2.56
22	2.95	1.55	6.51	6.55	8.55	5.54	6.06	3.23	3.33	3.33	7.91	2.45
23	3.65	1.55	6.34	6.66	9.95	5.28	5.29	3.05	3.09	3.13	6.88	3.07
24	4.39	1.62	5.90	8.60	10.80	5.41	4.97	2.70	2.65	5.15	6.07	3.00
25	3.78	1.61	5.41	10.20	11.10	6.00	4.94	2.56	2.29	8.80	5.44	2.85
26	3.31	1.59	5.05	11.55	9.75	6.56	4.87	2.55	2.18	6.31	4.90	2.95
27	3.14	1.88	4.74	10.05	8.63	6.50	4.75	2.37	1.98	5.33	4.55	2.88
28	2.88	1.86	4.55	8.55	7.67	6.26	4.81	2.32	2.01	4.80	4.24	2.73
29	2.69	.....	4.25	7.52	7.35	6.04	5.04	2.25	2.39	4.34	3.95	2.66
30	3.30	.....	4.09	6.82	7.14	6.28	5.03	2.15	2.25	4.00	3.76	2.67
31	3.25	.....	3.93	.....	7.56	.....	4.82	2.34	.....	3.75	.....	2.55

Daily discharge, in second-feet, of Skagit River near Marblemount, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,040	3,010	1,880	4,360	9,720	16,000	9,440	5,580	2,270	5,400	3,930	3,760
2	1,930	2,670	2,530	4,040	9,320	13,700	9,600	4,720	2,340	2,910	3,820	4,150
3	1,860	2,560	3,280	3,930	9,200	11,100	9,560	4,890	2,510	5,780	3,690	4,000
4	1,810	2,390	3,540	3,770	9,720	10,400	9,440	5,400	2,450	3,810	3,360	3,900
5	1,770	2,310	3,420	4,580	10,800	12,200	9,460	5,080	2,360	3,960	3,210	3,790
6	1,730	2,230	2,890	5,220	13,600	13,900	9,480	5,100	2,150	10,600	4,570	3,760
7	1,740	2,140	2,700	4,960	17,200	12,600	9,920	5,400	2,150	11,900	9,340	3,760
8	1,730	2,040	2,480	4,830	20,000	11,000	10,800	6,620	1,890	10,200	8,500	3,640
9	1,690	1,970	2,330	4,960	19,900	10,900	11,000	6,860	1,720	12,000	6,930	3,560
10	1,640	1,940	2,300	4,870	27,600	13,000	11,900	6,410	1,650	8,250	13,000	3,330
11	1,640	1,880	2,410	4,940	25,900	20,200	13,100	5,990	1,540	6,350	12,000	3,050
12	1,610	1,800	2,670	5,330	22,000	18,100	13,400	5,100	1,480	5,210	9,460	2,910
13	1,570	1,850	3,200	5,540	18,800	13,300	11,900	4,720	1,450	4,370	7,740	2,790
14	1,560	1,770	3,930	5,220	16,000	11,900	10,400	4,620	1,520	3,940	6,490	2,640
15	1,520	1,710	4,810	4,990	13,200	11,700	9,970	3,760	1,650	4,440	5,540	2,540
16	1,500	1,620	5,770	5,200	11,900	12,200	10,200	3,420	1,970	4,720	4,870	2,460
17	1,500	1,560	6,710	5,730	12,700	10,900	9,720	3,520	2,660	7,950	4,350	2,390
18	1,690	1,560	7,350	6,440	15,600	10,200	8,460	3,610	2,290	6,300	4,100	2,270
19	1,590	1,560	8,000	8,980	14,900	9,170	7,930	4,010	2,470	4,900	3,760	2,230
20	1,500	1,560	8,850	11,000	13,000	8,980	8,160	4,310	3,050	4,190	5,600	2,290
21	1,550	1,470	9,560	10,700	12,900	8,360	8,980	3,740	3,420	3,640	21,300	2,300
22	3,040	1,520	9,840	9,940	15,500	7,590	8,780	3,160	3,320	3,320	13,600	2,170
23	4,090	1,520	9,440	10,200	20,000	7,020	7,040	2,910	2,970	3,020	10,800	2,940
24	5,390	1,580	8,420	15,700	23,200	7,300	6,350	2,470	2,410	6,730	8,800	2,840
25	4,300	1,570	7,390	20,900	24,400	8,640	6,280	2,300	1,990	16,300	7,370	2,650
26	3,560	1,550	6,650	26,300	19,400	9,970	6,140	2,290	1,870	9,360	6,200	2,780
27	3,300	1,790	6,060	20,400	15,800	9,820	5,880	2,080	1,660	7,130	5,480	2,690
28	2,940	1,770	5,700	15,500	12,900	9,240	6,010	2,020	1,690	5,990	4,890	2,510
29	2,700	.....	5,120	12,500	12,000	8,730	6,490	1,940	2,100	5,080	4,350	2,420
30	3,540	.....	4,830	10,600	11,500	9,290	6,470	1,840	1,940	4,440	4,010	2,430
31	3,460	.....	4,550	.....	12,600	.....	6,030	2,040	.....	4,000	.....	2,290

NOTE.—Daily discharge determined from rating curves applicable as follows: Jan. 1 to May 9 (1909 curves used), well defined between 1,350 and 14,000 second-feet; May 10 to Sept. 31, well defined between 1,000 and 14,000 second-feet

Monthly discharge of Skagit River near Marblemount, Wash., for 1910.

[Drainage area, 1,090 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	5,390	1,500	2,310	2.12	2.44	142,000	A.
February	3,010	1,470	1,890	1.73	1.80	105,000	A.
March	9,840	1,880	5,120	4.70	5.42	315,000	A.
April	26,300	3,770	8,720	8.00	8.93	519,000	A.
May	27,600	9,200	15,800	14.5	16.72	972,000	A.
June	20,200	7,020	11,200	10.3	11.49	666,000	A.
July	13,400	5,880	8,980	8.24	9.50	552,000	A.
August	6,860	1,840	4,060	3.72	4.29	250,000	A
September	3,420	1,450	2,160	1.98	2.21	129,000	A.
October	16,300	2,910	6,330	5.81	6.70	389,000	A.
November	21,300	3,210	7,040	6.46	7.21	419,000	A.
December	4,150	2,170	2,940	2.70	3.11	181,000	A.
The year	27,600	1,450	6,410	5.88	79.82	4,640,000	

SKAGIT RIVER NEAR SEDRO WOOLLEY, WASH.

This station, which is located at the Northern Pacific Railway bridge in the NE. ¼ sec. 36, T. 35 N., R. 4 E., 1½ miles south of the railroad station of Sedro Woolley, just above Sterling Bend, about 12 miles above the head of tidewater at Mount Vernon, and about 25 miles from the mouth of the river, was established May 1, 1908, by the United States Engineer Corps, by which it was maintained until March 1, 1910, when it was taken over by the United States Geological Survey.

The station is below all important tributaries except Nookachamps River, which enters about 4 miles below. Beattys Slough takes water from the river bank about 1 mile above the station and returns it to the river about a mile

The gage, which is a vertical staff on the center pier of the draw span, was washed out during the flood of November, 1909, but was replaced by the observer at the same datum, and the records are continuous. The gage readings give the height above low water of Puget Sound.

Measurements are made from the railroad bridge, which affords a fairly good section.

Relation between gage height and discharge is not affected by ice, by log jams, or by artificial control.

Acknowledgment is due to the United States engineer office at Seattle, Maj. C. W. Kutz in charge, for the records of the measurements made in 1908 and of the gage heights prior to 1910.

All measurements made up to the end of 1910 fall on one curve, but the channel appears to shift somewhat, and the lack of measurements during 1909 and the early part of 1910 render the records for these periods a little uncertain.

Discharge measurements of Skagit River near Sedro Woolley, Wash., 1908–1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1908.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 12	F. S. Greely	840	9,720	46.40	40,200
20	.....do	814	5,960	41.80	19,700
Oct. 10	.....do	729	1,630	35.80	3,790
Nov. 5	.....do	798	4,800	39.80	14,300
1910.					
Aug. 26	Henshaw and Gilkey	575	3,730	37.50	6,700
Sept. 30	Kimble and Gilkey	649	4,110	37.94	8,330
Oct. 13[a]	.....do	675	4,690	39.65	14,000

[a] Area and discharge of Beattys Slough estimated.

Daily gage height, in feet, of Skagit River near Sedro Woolley, Wash., for 1908–1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.								
1	40.8	40.4	44.65	39.85	37.05	36.0	39.7	38.15
2	42.0	40.65	45.8	39.45	37.15	37.25	42.7	37.85
3	40.95	40.2	45.6	39.05	37.1	36.4	43.55	37.6
4	40.3	40.35	44.35	39.2	37.1	36.1	41.65	37.45
5	39.8	40.65	42.9	39.25	37.25	35.8	39.7	37.25
6	39.85	41.0	42.5	39.3	37.15	35.65	38.9	37.1
7	41.0	42.25	43.25	39.15	37.25	35.5	38.2	37.0
8	41.45	44.7	44.35	39.05	37.8	35.5	37.8	37.95
9	40.65	46.55	44.7	39.2	37.3	35.5	37.45	38.1
10	40.05	47.4	44.1	39.05	37.05	35.65	37.1	37.6
11	39.8	47.55	44.05	38.85	37.2	35.8	36.9	37.45
12	39.45	46.45	44.65	38.75	37.35	35.7	36.65	38.1
13	39.15	45.5	45.15	38.35	37.15	36.95	36.45	39.8
14	39.1	45.75	45.2	38.4	37.1	37.65	36.3	38.75
15	39.25	46.55	44.4	38.45	37.05	37.25	36.15	38.15
16	39.6	45.3	43.95	38.65	36.95	36.8	37.0	37.75
17	39.75	43.9	42.2	38.95	36.8	36.5	48.05	37.5
18	40.2	43.0	42.6	39.05	36.6	36.25	51.75	37.25
19	40.9	42.45	43.05	39.2	36.45	36.15	47.65	37.05
20	40.55	41.8	43.0	39.25	36.35	36.35	44.5	37.0
21	40.45	41.15	43.35	39.05	36.4	36.15	44.0	37.0
22	40.3	40.9	43.6	38.8	36.35	36.0	43.9	37.0
23	40.3	40.85	43.4	39.25	36.15	36.3	42.85	37.0
24	41.0	41.55	42.85	38.9	36.0	36.35	41.4	37.0
25	42.35	43.4	41.6	38.2	35.9	36.3	40.4	37.25
26	41.7	43.65	40.65	37.75	35.65	36.2	39.65	39.3
27	41.0	43.15	39.85	37.35	35.55	36.25	39.1	39.25
28	41.0	42.0	39.4	38.85	35.5	36.25	38.75	40.3
29	41.25	41.35	39.05	38.4	35.5	37.4	38.6	39.4
30	41.0	42.45	39.0	37.65	35.6	39.95	38.35	38.55
31	40.5	.....	39.4	37.25	.....	40.9	.....	38.05

Daily gage height, in feet, of Skagit River near Sedro Woolley, Wash., for 1908–1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	37.65	37.45	37.3	39.7	37.8	45.3	42.05	39.4	37.75	37.5	38.0	50.95
2	37.85	37.65	37.25	39.0	38.15	47.85	42.0	38.95	37.95	37.0	42.0	46.45
3	40.75	38.05	37.1	38.45	39.25	47.8	42.2	38.65	38.2	36.75	45.95	43.85
4	40.05	38.0	37.45	38.05	40.85	45.85	42.55	38.7	38.45	36.5	43.1	42.7
5	38.9	37.8	37.25	37.75	40.6	44.75	42.35	38.4	38.45	36.5	40.8	41.9
6	36.55	37.6	37.0	37.6	39.8	43.7	42.45	38.2	38.45	37.8	39.6	41.45
7	37.7	37.55	37.0	37.5	39.2	43.1	43.2	38.2	38.15	38.55	38.85	40.95
8	37.45	37.4	37.05	37.35	38.85	43.3	42.45	38.3	37.8	37.6	38.75	40.75
9	37.4	37.25	37.0	37.5	38.8	44.0	42.45	38.25	37.45	38.05	38.7	40.5
10	37.4	37.1	36.9	37.7	39.0	44.95	42.05	38.4	37.45	39.3	38.45	39.95
11	37.95	37.0	36.75	37.6	38.75	46.0	42.35	38.1	37.6	38.5	38.1	39.8
12	38.3	36.9	36.7	37.65	38.6	46.2	42.8	38.2	37.0	38.0	37.8	46.4
13	38.4	36.75	36.55	38.0	38.55	44.6	41.55	38.25	36.85	37.9	37.6	45.8
14	38.4	36.65	36.85	38.15	38.85	43.85	41.15	38.3	36.75	38.1	37.3	43.0
15	37.8	36.7	36.75	38.1	39.15	44.45	41.4	38.55	36.6	37.3	37.2	41.75
16	38.3	38.35	36.9	37.95	39.45	44.1	41.55	38.05	36.6	37.0	37.1	41.05
17	40.15	40.2	37.05	37.7	39.55	43.35	40.85	37.75	37.05	36.9	37.15	40.65
18	40.75	39.25	37.05	37.55	39.65	43.1	40.05	37.9	36.95	36.6	43.0	40.2
19	40.6	38.95	37.05	37.35	40.1	43.35	39.65	38.0	36.5	36.5	49.65	40.0
20	43.5	38.5	37.0	37.3	40.05	43.15	39.75	38.5	37.4	36.55	45.55	39.8
21	41.05	38.1	36.85	37.3	39.55	42.65	39.75	37.9	38.9	36.85	42.3	39.5
22	39.95	37.65	36.85	37.35	39.15	42.1	40.35	37.55	38.1	36.95	41.9	39.35
23	39.2	37.5	36.75	37.5	39.15	41.6	40.75	37.35	37.25	37.2	50.3	39.25
24	38.75	37.55	36.75	37.6	39.95	41.65	40.5	37.15	37.15	38.5	52.2	39.0
25	38.35	37.75	36.95	38.15	41.35	41.4	40.25	37.15	37.0	37.5	47.95	38.9
26	38.05	37.55	37.05	38.9	42.95	41.65	39.55	41.3	37.15	37.05	44.0	38.55
27	37.85	37.45	37.25	38.5	43.2	42.65	39.5	40.2	36.85	36.8	42.25	38.5
28	37.6	37.4	37.5	38.3	42.9	41.65	39.4	38.6	36.70	36.55	44.6	38.4
29	37.4	.....	37.6	38.2	42.4	41.15	39.4	38.0	37.5	36.95	52.8	38.3
30	37.25	.....	37.8	37.95	41.9	41.65	39.85	37.8	38.35	37.0	56.1	38.35
31	37.2	.....	38.6	.....	43.6	.....	39.55	37.7	.....	37.25	.....	38.5

[E. J. Woods, observer.]

1910.												
1	38.45	39.75	39.4	39.3	41.1	43.5	40.6	39.5	37.5	40.1	38.8	39.6
2	38.25	39.3	40.7	39.2	40.9	43.2	40.7	39.1	37.5	40.5	39.1	40.4
3	38.05	39.0	41.4	39.0	40.8	42.1	40.7	38.9	37.6	44.0	39.6	41.0
4	38.0	38.75	41.6	38.9	41.0	41.5	40.7	38.9	37.7	44.2	39.4	40.4
5	38.05	38.5	41.3	39.0	41.4	42.0	40.8	39.1	37.6	42.5	39.0	40.3
6	37.85	38.4	40.4	41.0	42.4	42.2	40.7	39.0	37.5	41.7	39.6	41.0
7	37.7	38.3	39.8	40.4	43.0	42.3	40.8	39.0	37.4	47.0	43.5	41.1
8	37.75	38.2	39.4	40.5	43.9	41.8	41.0	39.3	37.3	43.1	44.6	40.6
9	37.65	38.1	39.1	40.5	44.5	41.2	41.4	39.7	37.2	44.5	42.0	40.8
10	37.6	38.1	38.9	40.3	45.4	41.5	42.1	39.8	37.1	43.2	43.9	40.1
11	37.5	37.9	38.8	40.2	48.6	43.5	42.5	39.5	37.0	41.8	49.3	39.7
12	37.5	37.8	39.0	40.3	47.0	45.8	42.9	39.2	36.8	40.4	44.4	39.4
13	37.4	37.9	39.7	40.4	45.4	43.4	42.5	39.0	36.8	39.7	42.4	39.1
14	37.4	37.95	40.4	40.2	44.1	42.1	41.5	38.8	36.8	39.3	41.3	38.9
15	37.35	37.9	40.4	39.9	43.0	41.6	41.0	39.0	36.9	39.2	40.5	38.8
16	37.3	37.75	41.2	39.6	42.1	41.7	40.9	38.5	37.0	39.4	40.1	38.9
17	37.3	37.65	41.4	39.7	42.1	41.6	40.9	38.4	37.3	41.0	39.6	38.9
18	37.65	37.5	42.2	39.8	43.0	41.1	40.7	38.3	37.5	42.1	39.4	38.7
19	38.0	37.4	42.0	40.5	43.3	40.6	40.2	38.4	37.3	40.4	39.3	38.5
20	37.6	37.4	42.4	41.8	42.5	41.0	40.2	38.8	37.6	39.6	41.0	38.5
21	37.5	37.35	42.3	42.3	42.1	41.0	40.5	38.7	38.0	39.1	50.7	38.6
22	39.1	37.3	42.1	41.5	42.9	40.7	40.7	38.6	38.2	38.8	50.6	38.4
23	42.2	37.15	42.0	41.8	44.3	40.2	40.5	38.1	38.1	38.5	46.1	39.8
24	44.0	37.55	41.5	43.0	45.3	40.0	39.7	37.9	37.8	38.6	43.9	42.5
25	42.15	38.75	40.9	44.9	46.5	40.1	39.6	37.6	37.5	47.8	42.4	40.5
26	40.7	38.4	40.4	46.8	45.5	41.0	39.5	37.5	37.2	44.0	41.4	39.8
27	40.0	38.75	40.1	45.6	44.1	41.1	39.4	37.5	37.0	41.5	40.6	39.8
28	39.95	39.45	39.8	43.9	43.0	40.8	39.4	37.4	36.9	40.4	40.3	39.4
29	39.7	.....	39.6	42.5	42.4	40.5	39.5	37.4	37.0	39.7	39.9	39.1
30	.....	.....	39.4	41.6	42.4	40.4	39.7	37.3	37.8	39.3	39.6	39.3
31	.....	.....	39.4	.....	42.3	.....	39.5	37.2	.....	39.0	.....	39.2

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for 1908–1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.								
1	17,000	15,600	32,100	13,800	6,420	4,240	13,400	9,080
2	21,400	16,500	37,400	12,600	6,640	6,880	24,100	8,320
3	17,500	15,000	36,400	11,400	6,530	5,010	27,500	7,710
4	15,300	15,500	30,900	11,900	6,530	4,420	20,100	7,350
5	13,700	16,500	24,900	12,000	6,880	3,890	13,400	6,880
6	13,800	17,700	23,300	12,200	6,640	3,640	11,000	6,530
7	17,700	22,400	26,300	11,700	6,880	3,400	9,200	6,300
8	19,300	32,400	30,900	11,400	8,200	3,400	8,200	8,580
9	16,500	40,900	32,400	11,900	6,990	3,400	7,350	8,950
10	14,500	45,100	29,800	11,400	6,420	3,640	6,530	7,710
11	13,700	45,800	29,600	10,900	6,760	3,890	6,080	7,350
12	12,600	40,500	32,200	10,600	7,110	3,720	5,540	8,950
13	11,700	36,000	34,400	9,590	6,640	6,190	5,120	13,700
14	11,600	37,100	34,600	9,720	6,530	7,830	4,810	10,600
15	12,000	40,900	31,100	9,850	6,420	6,880	4,520	9,080
16	13,000	35,000	29,200	10,400	6,190	5,860	6,300	8,080
17	13,500	29,000	22,200	11,200	5,860	5,220	48,400	7,470
18	15,000	25,300	23,700	11,400	5,430	4,710	68,800	6,880
19	17,400	23,100	25,500	11,900	5,120	4,520	46,400	6,420
20	16,100	20,600	25,300	12,000	4,910	4,910	31,500	6,300
21	15,800	18,200	26,700	11,400	5,010	4,520	29,400	6,300
22	15,300	17,400	27,700	10,800	4,910	4,240	29,000	6,300
23	15,300	17,200	26,900	12,000	4,520	4,810	24,700	6,300
24	17,700	19,700	24,700	11,000	4,240	4,910	19,200	6,300
25	22,700	26,900	19,900	9,200	4,060	4,810	15,600	6,880
26	20,300	27,900	16,500	8,080	3,640	4,610	13,200	12,200
27	17,700	25,900	13,800	7,110	3,480	4,710	11,600	12,000
28	17,700	21,400	12,400	10,900	3,400	4,710	10,600	15,300
29	18,600	19,000	11,400	9,720	3,400	7,230	10,200	12,400
30	17,700	23,100	11,300	7,830	3,560	14,100	9,590	10,100
31	16,000	.....	12,400	6,880	.....	17,400	.....	8,820

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	7,830	7,350	6,990	13,400	8,200	35,000	21,600	12,400	8,080	7,470	8,700	64,100
2	8,320	7,830	6,880	11,300	9,080	47,400	21,400	11,200	8,580	6,300	21,400	40,500
3	16,800	8,820	6,530	9,850	12,000	47,100	22,200	10,400	9,200	5,750	38,100	28,800
4	14,500	8,700	7,350	8,820	17,200	37,600	23,500	10,500	9,850	5,220	25,700	24,100
5	11,000	8,200	6,880	8,080	16,300	32,600	22,700	9,720	9,850	5,220	17,000	21,000
6	5,320	7,710	6,300	7,710	13,700	28,200	23,100	9,200	9,850	8,200	13,000	19,300
7	7,950	7,590	6,300	7,470	11,900	25,700	26,100	9,200	9,080	10,100	10,900	17,500
8	7,350	7,230	6,420	7,110	10,900	26,500	23,100	9,460	8,200	7,710	10,600	16,800
9	7,230	6,880	6,300	7,470	10,800	29,400	23,100	9,330	7,350	8,820	10,500	16,000
10	7,230	6,530	6,080	7,950	11,300	33,500	21,600	9,720	7,350	12,200	9,850	14,100
11	8,580	6,300	5,750	7,710	10,600	38,300	22,700	8,950	7,710	9,980	8,950	13,700
12	9,460	6,080	5,640	7,830	10,200	39,300	24,500	9,200	6,300	8,700	8,200	40,200
13	9,720	5,750	5,320	8,700	10,100	32,000	19,700	9,330	5,970	8,450	7,710	37,400
14	9,720	5,540	5,970	9,080	10,900	28,800	18,200	9,460	5,750	8,950	6,990	25,500
15	8,200	5,640	5,750	8,950	11,700	31,300	19,200	10,100	5,430	6,990	6,760	20,300
16	9,460	9,590	6,080	8,580	12,600	29,800	19,700	8,820	5,430	6,300	6,530	17,900
17	14,800	15,000	6,420	7,950	12,900	26,700	17,200	8,080	6,420	6,080	6,640	16,500
18	16,800	12,000	6,420	7,590	13,200	25,700	14,500	8,450	6,190	5,430	25,300	15,000
19	16,300	11,200	6,420	7,110	14,600	26,700	13,200	8,700	5,220	5,220	56,900	14,300
20	27,300	9,980	6,300	6,990	14,500	25,900	13,500	9,980	7,230	5,320	36,200	13,700
21	17,900	8,950	5,970	6,990	12,900	23,900	13,500	8,450	11,000	5,970	22,600	12,700
22	14,100	7,830	5,970	7,110	11,700	21,800	15,500	7,590	8,950	6,190	21,000	12,300
23	11,900	7,470	5,750	7,470	11,700	19,900	16,800	7,110	6,880	6,760	60,500	12,000
24	10,600	7,590	5,750	7,710	14,100	20,100	16,000	6,640	6,640	9,980	71,400	11,300
25	9,590	8,080	6,190	9,080	19,000	19,200	15,100	6,640	6,300	7,470	47,800	11,000
26	8,820	7,590	6,420	11,000	25,100	20,100	12,900	18,800	6,640	6,420	29,400	10,100
27	8,320	7,350	6,880	9,980	26,100	23,900	12,700	15,000	5,970	5,860	22,400	9,980
28	7,710	7,230	7,470	9,460	24,900	20,100	12,400	10,200	5,640	5,320	32,000	9,720
29	7,230	.....	7,710	9,200	22,900	18,200	12,400	8,700	7,470	6,190	75,000	9,460
30	6,880	.....	8,200	8,580	21,000	20,100	13,800	8,200	9,590	6,300	96,100	9,590
31	6,760	.....	10,200	.....	27,700	.....	12,900	7,950	.....	6,880	.....	9,980

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for 1908–1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	9,850	13,500	12,400	12,200	18,100	27,300	16,300	12,700	7,470	14,600	10,800	13,000
2	9,330	12,200	16,600	11,900	17,400	26,100	16,600	11,600	7,470	16,000	11,600	15,600
3	8,820	11,300	19,200	11,300	17,000	21,800	16,600	11,000	7,710	29,400	13,000	17,700
4	8,700	10,600	19,900	11,000	17,700	19,500	16,600	11,000	7,950	30,200	12,400	15,600
5	8,820	9,980	18,800	11,300	19,200	21,400	17,000	11,600	7,710	23,300	11,300	15,300
6	8,320	9,720	15,600	17,700	22,900	22,200	16,600	11,300	7,470	20,300	13,000	17,700
7	7,950	9,460	13,700	15,600	25,300	22,600	17,000	11,300	7,230	43,200	27,300	18,100
8	8,080	9,200	12,400	16,000	29,000	20,600	17,700	12,200	6,990	25,700	32,000	16,300
9	7,830	8,950	11,600	16,000	31,500	18,400	19,200	13,400	6,760	31,500	21,400	17,000
10	7,710	8,950	11,000	15,300	35,500	19,500	21,800	13,700	6,530	26,100	29,000	14,600
11	7,470	8,450	10,800	15,000	51,200	27,300	23,300	12,700	6,300	20,600	55,000	13,400
12	7,470	8,200	11,300	15,300	43,200	37,400	24,900	11,900	5,860	15,600	31,100	12,400
13	7,230	8,450	13,400	15,600	35,500	26,900	23,300	11,300	5,860	13,400	22,900	11,600
14	7,230	8,580	15,600	15,000	29,800	21,800	19,500	10,800	5,860	12,200	18,800	11,000
15	7,110	8,450	15,600	14,000	25,300	19,900	17,700	11,300	6,080	11,900	16,000	10,800
16	6,990	8,080	18,400	13,000	21,800	20,300	17,400	9,980	6,300	12,400	14,600	11,000
17	6,990	7,830	19,200	13,400	21,800	19,900	17,400	9,720	6,990	17,700	13,000	11,000
18	7,830	7,470	22,200	13,700	25,300	18,100	16,600	9,460	7,470	21,800	12,400	10,500
19	8,700	7,230	21,400	16,000	26,500	16,300	15,000	9,720	6,990	15,600	12,200	9,980
20	7,710	7,230	22,900	20,600	23,300	17,700	15,000	10,800	7,710	13,000	17,700	9,980
21	7,470	7,110	22,600	22,600	21,800	17,700	16,000	10,500	8,700	11,600	62,700	10,200
22	11,600	6,990	21,800	19,500	24,900	16,600	16,600	10,200	9,200	10,800	62,200	9,720
23	22,200	6,640	21,400	20,600	30,700	15,000	16,000	8,950	8,950	9,980	38,800	13,700
24	29,400	7,590	19,500	25,300	35,000	14,300	13,400	8,450	8,200	10,200	29,000	23,300
25	22,000	10,600	17,400	33,300	40,700	14,600	13,000	7,710	7,470	47,100	22,900	16,000
26	16,600	9,720	15,600	42,200	36,000	17,700	12,700	7,470	6,760	29,400	19,200	13,700
27	14,300	10,600	14,600	36,400	29,800	18,100	12,400	7,470	6,300	19,500	16,300	13,700
28	14,100	12,600	13,700	29,000	25,300	17,000	12,400	7,230	6,080	15,600	15,300	12,400
29	13,400	.....	13,000	23,300	22,900	16,000	12,700	7,230	6,300	13,400	14,000	11,600
30	13,400	.....	12,400	19,900	22,900	15,600	13,400	6,990	8,200	12,200	13,000	12,200
31	13,400	.....	12,400	.....	22,600	.....	12,700	6,760	.....	11,300	.....	11,900

NOTE.—Daily discharge determined from a rating curve well defined for the period covered by measurements in 1908 and the latter part of 1910, but somewhat uncertain for 1909 and the first few months of 1910.

Monthly discharge of Skagit River near Sedro Woolley, Wash., for 1908–1910.

[Drainage area, 2,930 square miles].

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1908.							
May	22,700	11,600	16,100	5.49	6.33	990,000	A.
June	45,800	15,000	26,300	8.98	10.02	1,560,000	A.
July	37,400	11,300	25,700	8.77	10.11	1,580,000	A.
August	13,800	6,880	10,700	3.65	4.21	658,000	A.
September	8,200	3,400	5,640	1.93	2.15	336,000	A.
October	17,400	3,400	5,540	1.89	2.18	341,000	A.
November	68,800	4,520	18,000	6.14	6.85	1,070,000	B.
December	15,300	6,300	8,550	2.92	3.37	526,000	B.
The period	68,800	3,400	14,500	4.95	45.22	7,060,000	
1909.							
January	27,300	5,320	10,800	3.69	4.25	664,000	B.
February	15,000	5,540	8,070	2.75	2.86	448,000	B.
March	10,200	5,320	6,540	2.23	2.57	402,000	B.
April	13,400	6,990	8,540	2.91	3.25	508,000	B.
May	27,700	8,200	14,800	5.05	5.82	910,000	B.
June	47,400	18,200	28,500	9.73	10.86	1,700,000	B.
July	26,100	12,400	18,200	6.21	7.16	1,120,000	B.
August	18,800	6,640	9,590	3.27	3.77	590,000	B.
September	11,000	5,220	7,470	2.55	2.84	444,000	B
October	12,200	5,220	7,150	2.44	2.81	440,000	B.
November	96,100	6,530	27,100	9.25	10.32	1,610,000	B.
December	64,100	9,460	19,200	6.55	7.55	1,180,000	B.
The year	96,100	5,220	13,800	4.71	64.06	10,000,000	

Monthly discharge of Skagit River near Sedro Woolley, Wash., for 1908–1910—Continued.

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
1910.							
January	29,400	6,990	10,900	3.72	4.29	670,000	B.
February	13,500	6,640	9,130	3.12	3.25	507,000	B.
March	22,900	10,800	16,300	5.56	6.41	1,000,000	B.
April	42,200	11,000	18,700	6.38	7.12	1,110,000	B.
May	51,200	17,000	27,400	9.35	10.78	1,680,000	B.
June	37,400	14,300	20,300	6.93	7.73	1,210,000	A.
July	24,900	12,400	16,700	5.71	6.58	1,030,000	A.
August	13,700	6,760	10,200	3.48	4.01	627,000	A.
September	9,200	5,860	7,160	2.44	2.72	426,000	A.
October	47,100	9,980	19,500	6.66	7.68	1,200,000	A.
November	62,700	10,800	22,900	7.82	8.72	1,360,000	A.
December	23,300	9,720	13,600	4.64	5.35	836,000	A.
The year	62,700	5,860	16,100	5.49	74.64	11,700,000	

CASCADE RIVER NEAR MARBLEMOUNT, WASH.

This station, which is located 8 miles above the mouth of Cascade River and the same distance above Marblemount, Wash., at a proposed site for a dam and power plant, was established March 8, 1908, by the Skagit Power Co., which installed the equipment and furnishes gage readings and most of the discharge measurements. Above this point the river grade is comparatively flat and considerable storage can here be developed.

Three gages have been read, as follows: Gage No. 1 at a foot log below the camp of the power company. This gage was used from March 8 to March 31, 1909. Gage No. 2 was installed April 1, 1909, about 6 miles downstream and set to read the same as No. 1. As the river grade is very flat they are assumed to read the same at all stages. It was in use from April 1 to May 24, 1909. Gage No. 3 was put in May 25, 1909, and used to the end of 1910. It is 500 feet above the location of No. 1, which had washed out. On June 1, 1909, the cable was moved to gage No. 3. Rating curves have been developed for the three gages. Gage No. 3 is a vertical staff on the right bank 100 feet upstream from the cable from which measurements are made.

The channel in the vicinity of the station is straight; the banks are too high to overflow. The bed of the stream is of gravel and cobblestones and permanent except during extreme high water. The water at all stages is comparatively swift and the bed is rough. On this account it is necessary to obtain a relatively large number of measurements, and individual measurements must be made with extra care to be reliable.

The following discharge measurement was made by Freeman and Gilkey:

December 31, 1910: Width, 99 feet; area, 128 square feet; gage height, 1.87 feet; discharge, 556 second-feet.

Daily gage height, in feet, of Cascade River near Marblemount, Wash., for 1910.

[Skagit Power Co., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.41	1.72	1.43	1.73	1.98	3.52	3.35	2.80	2.08	4.52	2.60	2.32
2	1.30	1.62	1.64	1.70	1.96	2.48	3.35	2.50	2.10	2.78	2.38	2.92
3	1.23	1.54	1.90	1.68	1.95	2.08	3.45	2.62	2.10	6.00	2.29	2.70
4	1.18	1.46	2.06	1.65	2.22	2.10	3.35	2.64	1.96	3.85	2.18	2.50
5	1.16	1.42	1.93	2.20	2.34	2.60	3.40	2.55	1.95	3.52	2.05	2.30
6	1.15	1.40	1.83	2.49	2.80	2.46	3.45	2.47	1.93	6.50	2.65	2.42
7	1.14	1.38	1.63	2.16	3.55	2.41	3.90	2.75	1.79	4.95	5.30	2.40
8	1.14	1.38	1.54	2.06	3.80	2.00	3.90	2.90	1.70	4.85	3.35	2.38
9	1.12	1.37	1.55	2.19	3.86	2.15	4.25	3.05	1.58	5.25	3.38	2.34
10	1.12	1.42	1.48	2.08	6.38	3.07	4.71	3.10	1.60	3.70	7.70	2.32
11	1.12	1.38	1.59	2.11	4.90	5 95	5.12	2.90	1.52	3.15	4.50	2.12
12	1.10	1.37	1.87	2.36	3.68	3.57	4.65	2.85	1.48	3.00	3.60	2.08
13	1.10	1.22	2.12	2.33	3.31	2.41	4.10	2.90	1.50	2.90	3.13	2.00
14	1.10	1.19	2.38	2.10	3.19	2.41	3.78	2.50	1.52	3.05	2.75	1.99
15	1.10	1.14	3.01	2.02	2.25	2.30	3.70	2.42	1.55	2.80	2.58	2.10
16	1.08	1.12	3.03	2.14	2.12	2.50	3.79	2.39	1.98	3.05	2.40	2.00
17	1.08	1.10	3.26	2.04	2.55	2.10	3.56	2.44	2.35	5.00	2.25	1.97
18	1.18	1.09	3.30	2.46	3.08	1.87	3.27	2.41	2.00	3.15	2.15	1.92
19	1.14	1.09	3.33	3.15	2.54	2.00	3.37	2.62	2.42	2.78	2.08	1.84
20	1.10	1.10	3.30	3.44	2.18	2.03	3.65	2.61	2.76	2.45	5.15	1.92
21	1.16	1.08	3.23	2.98	2.40	1.88	3.74	2.48	2.55	2.25	7.95	1.86
22	2.45	1.09	3.20	2.84	3.54	1.62	3.92	2.30	2.58	2.12	4.75	1.84
23	3.00	1.10	2.95	3.36	4.17	1.44	3.38	2.08	2.25	2.00	4.10	2.58
24	3.25	1.24	2.86	4.12	5.22	1.51	3.04	1.90	1.95	5.65	3.35	2.68
25	2.41	1.27	2.72	5.06	4.72	1.98	3.03	1.90	1.78	7.10	3.00	2.32
26	2.02	1.26	2.37	5.04	3.24	3.40	2.98	1.88	1.72	3.50	2.80	2.20
27	1.85	1.28	2.27	3.47	3.00	3.28	2.88	1.80	1.64	3.00	2.58	2.10
28	1.78	1.33	2.10	2.70	2.88	3.25	3.00	1.83	1.68	2.75	2.40	2.02
29	1.68	.....	1.88	2.29	2.45	2.90	3.22	1.78	2.55	2.45	2.30	1.99
30	2.12	.....	1.78	2.00	2.45	2.80	3.05	1.66	2.00	2.30	2.22	1.98
31	1.94	.....	1.73	.....	2.67	.....	2.99	1.95	.....	2.20	.....	1.90

Daily discharge, in second-feet, of Cascade River near Marblemount, Wash., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	394	520	400	525	658	2,130	1,920	1,320	718	3,480	1,130	896
2	355	474	483	510	646	1,020	1,920	1,060	730	1,300	944	1,440
3	330	441	610	501	640	718	2,040	1,150	730	6,170	872	1,220
4	314	411	706	488	816	730	1,920	1,170	646	2,560	786	1,040
5	308	397	628	800	912	1,130	1,980	1,080	640	2,130	700	880
6	305	390	575	1,030	1,320	1,010	2,040	1,020	628	7,260	1,180	966
7	302	383	478	772	2,160	968	2,620	1,270	555	4,160	4,780	960
8	302	383	441	706	2,490	670	2,620	1,420	510	4,000	1,920	944
9	296	380	445	793	2,570	765	3,090	1,580	457	4,690	1,960	912
10	296	397	418	718	7,000	1,600	3,780	1,630	465	2,360	10,200	896
11	296	383	461	737	4,080	6,060	4,460	1,420	433	1,680	3,450	744
12	290	380	595	928	2,330	2,190	3,680	1,370	418	1,520	2,230	718
13	290	327	744	904	1,870	968	2,880	1,420	425	1,420	1,660	670
14	290	317	944	730	1,730	968	2,460	1,040	433	1,580	1,270	610
15	290	302	1,530	682	840	880	2,360	976	445	1,320	1,110	730
16	284	296	1,550	758	744	1,040	2,480	952	658	1,580	960	670
17	284	290	1,810	694	1,080	730	2,180	992	920	4,250	840	652
18	314	287	1,860	1,010	1,610	595	1,820	968	670	1,680	765	622
19	302	287	1,900	1,680	1,080	670	1,940	1,150	976	1,300	718	580
20	290	290	1,860	2,030	786	688	2,300	1,140	1,280	1,000	4,510	622
21	308	284	1,780	1,500	960	600	2,410	1,020	1,080	840	10,800	590
22	1,000	287	1,740	1,360	2,150	474	2,660	880	1,110	744	3,840	580
23	1,520	290	1,470	1,930	2,980	404	1,960	718	840	670	2,880	1,110
24	1,800	334	1,380	2,910	4,640	429	1,560	610	640	5,450	1,920	1,200
25	968	344	1,240	4,350	3,790	658	1,550	610	550	8,700	1,520	896
26	682	341	936	4,320	1,790	1,980	1,500	600	520	2,100	1,320	800
27	585	348	856	2,060	1,520	1,840	1,400	560	483	1,520	1,110	730
28	550	366	730	1,220	1,400	1,800	1,520	575	501	1,270	960	682
29	501	.....	600	872	1,000	1,420	1,760	550	1,080	1,000	880	664
30	744	.....	550	670	1,000	1,320	1,580	492	670	880	816	658
31	634	.....	525	.....	1,190	.....	1,510	640	.....	800	.....	610

NOTE.—Daily discharge determined from a rating curve well defined between 200 and 3,000 second-feet. It is probably applicable to gage readings for 1909 after the November flood, as the shift evidently occurred at that time.

Monthly discharge of Cascade River near Marblemount, Wash., for 1910.

[Drainage area, 222 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	1,800	284	498	2.24	2.58	30,600	A.
February	520	284	355	1.60	1.67	19,700	A.
March	1,900	400	976	4.40	5.07	60,000	A.
April	4,350	488	1,270	5.72	6.38	75,600	A.
May	7,000	640	1,860	8.38	9.66	114,000	B.
June	6,060	404	1,220	5.50	6.14	72,600	B.
July	4,460	1,400	2,250	10.1	11.64	138,000	A.
August	1,630	492	1,010	4.55	5.25	62,100	A.
September	1,280	418	674	3.04	3.39	40,100	A.
October	8,700	670	2,560	11.5	13.26	157,000	A.
November	10,800	700	2,270	10.2	11.38	135,000	A.
December	1,440	580	816	3.68	4.24	50,200	A.
The year	10,800	284	1,320	5.95	80.66	955,000	

SAUK RIVER ABOVE WHITECHUCK RIVER, NEAR DARRINGTON, WASH.

This station, which is located 100 yards above the Whitechuck Bridge, one-eighth mile above the mouth of Whitechuck River and 9½ miles above Darrington, was established August 29, 1910, in cooperation with the United States Forest Service.

The drainage area is 154 square miles.

The gage is an inclined staff about 200 feet above the bridge. Only occasional gage readings can be obtained, as they are made by the forest ranger in connection with his regular work. The records are fragmentary and cover only low-water periods, but in connection with those on the Whitechuck and on the Sauk above Clear Creek they give a general idea of the discharge of the stream.

Discharge measurements are made by wading about one-third mile above the gage.

The flow at this point is not influenced by ice or artificial control, and the daily fluctuation due to glaciers is probably less marked than it is on the Whitechuck.

The following measurement was made by H. P. Gilkey:

August 29, 1910: Width, 165 feet; area, 207 square feet; gage height, 1.95 feet; discharge, 256 second-feet.

Daily gage height, in feet, of Sauk River above Whitechuck River, near Darrington, Wash., for 1910.

Day.	Gage height.	Day	Gage height.
Aug. 29	1.95	Sept. 26	1.8
Aug. 31	2.15	Sept. 29	2.3
Sept. 13	1.7	Sept. 30	2.5
Sept. 20	2.05	Oct. 14	3.35
Sept. 23	2.1	Nov. 17	3.5

SAUK RIVER ABOVE CLEAR CREEK, NEAR DARRINGTON, WASH.

This station, which is located just above Clear Creek, at the Clear Creek ranger station, near the boundary of the Snoqualmie National Forest, 2½ miles above Darrington, Wash., was established August 28, 1910, in cooperation with the United States Forest Service.

Cougar and Goodman creeks are tributary to the river from the left, 1 and 2 miles, respectively, above the station. Whitechuck River enters from the right 7 miles above. Clear Creek enters from the left a few feet below the gage. Suiattle River, the principal tributary of the Sauk, enters about 10 miles below. The drainage area at this point is 259 square miles.

The gage is an inclined staff on the left bank; its datum has remained unchanged.

Discharge measurements are made from a cable and car at a narrow point in the river 300 feet above the gage.

The relation between gage height and discharge is not affected by ice, logging, or artificial control, but the gage heights show diurnal fluctuation due to the glacial character of the sources of the river; otherwise the records are excellent. The channel is probably permanent, though this can not be determined definitely until measurements have been made over a greater period of time.

Discharge measurements of Sauk River above Clear Creek, near Darrington, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft*	*Feet.*	*Sec.-ft.*
Aug. 29	H. P. Gilkey	.....	.....	0.50	[a] 485
Oct. 18	Kimble and Gilkey	122	636	1.93	2,400
Dec. 17	H. P. Gilkey	127	505	1.35	1,170

[a] Found by adding the discharges of Sauk and Whitechuck rivers above the forks, and increasing 10 per cent to allow for inflow between this point and Clear Creek.

Daily gage height, in feet, of Sauk River above Clear Creek, near Darrington, Wash., for 1910.

[E. G. Minn, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.65	2.60	1.30	.....	16	.....	0.50	1.35	1.80	.....
2	.....	.65	1.60	1.30	.....	17	.....	.....	2.00	1.58	1.35
3	.....	.62	4.50	1.60	.....	18	.....	.....	1.95	1.50	1.20
4	.....	.60	2.95	.....	.....	19	.....	.....	1.65	.....	1.40
5	.....	.58	2.45	.....	.....	20	.....	.60	1.50	.....	1.70
6	.....	.50	2.70	.....	.....	21	.....	.70	1.40	5.50	1.80
7	.....	.50	3.00	3.00	.....	22	.....	.....	1.30	.....	1.80
8	.....	.....	2.70	.....	.....	23	.....	.60	1.20	2.90	4.60
9	.....	.65	2.40	.....	.....	24	.....	.52	.....	2.50	3.3
10	.....	.72	1.95	4.60	.....	25	.....	.45	.....	.....	2.90
11	.....	.35	1.75	.....	.....	26	.....	.38	.....	.....	2.85
12	.....	.....	1.60	.....	.....	27	.....	.....	1.80	.....	2.90
13	.....	.32	1.50	.....	.....	28	0.5	.....	1.60	.....	2.60
14	.....	.32	1.40	2.00	.....	29	.5	.58	.....	.....	2.60
15	.....	.40	1.40	1.90	.....	30	.45	.80	.....	.....	2.60
						31	.65	.....	1.30	.....	2.10

SAUK RIVER AT SUIATTLE CROSSING, NEAR SAUK, WASH.

This station, which is located above the ford known as the Suiattle Crossing, 2½ miles below the mouth of Suiattle River and 10 miles above the mouth of the Sauk, near Sauk, Wash., was established August 27, 1910, in cooperation with the United States Forest Service.

The original gage was installed on the left bank of the river in the SE. ¼ sec. 6, T. 33 N., R. 10 E. This gage was washed away October 1 and had not been referred to any bench mark. A second gage was installed October 6, 1910, near the first. This gage also was washed out after a short time, and all the subsequent readings have been obtained by leveling from the bench mark. All readings prior to October 6 have been referred approximately to the gage established on that date, but are liable to some error.

Discharge measurements are made from a cable and car 200 yards above the ford.

Conditions for making measurements are excellent, but the records are subject to the uncertainty of the gage readings. A new gage was installed March 3, 1911, 4 miles above Sauk and 6 miles below the measuring section, where good records are being obtained.

Discharge measurements of Sauk River at Suiattle Crossing, near Sauk, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 16	Kimble and Gilkey	243	1,040	3.08	3,240
Nov. 8[a]	H. P. Gilkey	.....	2,000	6.78	11,300

[a] Incomplete measurement. Computed by comparison with velocities obtained later.

Daily gage height, in feet, of Sauk River at Suiattle Crossing, near Sauk, Wash., for 1910.

Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.
1	.....	.....	.....	11	.....	1.3	3.6	21	.....	1.8	.....
2	.....	.....	.....	12	.....	1.25	3.2	22	.....	1.8	.....
3	.....	.....	.....	13	.....	1.3	3.1	23	.....	1.75	.....
4	.....	.....	.....	14	.....	1.4	3.2	24	.....	1.75	3.5
5	.....	.....	.....	15	.....	1.4	3.1	25	.....	1.45	.....
6	.....	1.6	5.3	16	.....	1.65	4.4	26	.....	1.4	.....
7	.....	1.5	4.7	17	.....	.....	4.0	27	1.6	1.35	.....
8	.....	1.45	4.5	18	.....	.....	3.8	28	.....	1.3	.....
9	.....	1.35	4.2	19	.....	.....	3.2	29	.....	1.5	.....
10	.....	1.3	3.8	20	.....	.....	3.0	30	.....	1.9	.....
								31	.....	.....	.....

WHITECHUCK RIVER NEAR DARRINGTON, WASH.

This station, which is located near the mouth of the stream and below all tributaries, in the SW. ¼ sec. 13, T. 31 N., R. 10 E., was established August 29, 1910, in cooperation with the United States Forest Service.

The records show the total flow of the stream at its mouth, the drainage area being 80 square miles.

The gage, a vertical staff spiked to the foot log near the left bank, was carried away in the flood of 1910 and has not been replaced. The record is fragmentary.

Measurements are made by wading above the lower foot log. The stream is very rough and difficult to wade, even at low stages.

The following measurement was made by H. P. Gilkey:

August 29, 1910: Width, 67 feet; area, 101 square feet; gage height, 3.20 feet; discharge, 219 second-feet.

Daily gage height, in feet, of Whitechuck River near Darrington, Wash., for 1910.

Date.	Gage height.	Date.	Gage height.
Aug. 29	3.2	Sept. 26	3.2
Aug. 31	3.5	Sept. 29	3.7
Sept 13	3.1	Sept. 30	3.3
Sept. 20	3.45	Oct. 14	3.6
Sept. 23	3.4		

CLEAR CREEK NEAR DARRINGTON, WASH.

This station, which is located at the Forest Service bridge near the Clear Creek ranger station, 150 feet above the mouth of the stream and 2½ miles southeast of Darrington, in NE. ¼ SW. ¼ sec. 31, T. 32 N., R. 10 E., was established August 28, 1910, in cooperation with the United States Forest Service.

North and South forks unite about 2 miles above the station. The total drainage area is 30 square miles.

The gage is a vertical staff attached to the downstream side of the left bridge abutment and has remained unchanged since the station was established.

Measurements are made from the bridge or, at low water, by wading below the bridge.

Conditions for measuring are good, but the gage heights are liable to be affected by back water from the Sauk in times of flood.

Discharge measurements of Clear Creek near Darrington, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 28	Henshaw and Gilkey	38	35.4	0.67	18.4
Oct. 7	H. P. Gilkey	73	300	4.30	673
18	do	74	255	3.20	510
Nov. 10	do	106	639	7.48	4,080
Dec. 17	do	74	164	1.85	244

Daily gage height, in feet, of Clear Creek near Darrington, Wash., for 1910.

[E. G. Muir, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.9	4.0	2.0	.....	16	.....	0.6	1.65	2.1	.....
2	.....	.8	2.6	1.8	.....	17	.....	.....	4.5	1.9	1.85
3	.....	.7	6.7	3.2	.....	18	.....	.....	3.0	1.8	1.6
4	.....	.7	4.95	.....	.....	19	.....	.....	2.35	.....	1.8
5	.....	.7	4.25	.....	.....	20	.....	.65	2.05	7.0	1.9
6	.....	.7	4.1	.....	.....	21	.....	.7	1.85	8.3	1.9
7	.....	.7	4.4	5.8	.....	22	.....	.....	1.7	.....	1.85
8	.....	.....	4.0	.....	.....	23	.....	.65	1.6	4.2	5.1
9	.....	.9	3.8	.....	.....	24	.....	.6	.....	3.2	3.2
10	.....	1.0	2.95	7.45	.....	25	.....	.6	6.5	.....	2.7
11	.....	.5	2.45	.....	.....	26	.....	.6	.....	.....	2.75
12	.....	.....	2.15	.....	.....	27	.....	.....	2.4	.....	2.9
13	.....	.6	2.0	.....	1.7	28	0.7	.....	2.1	.....	2.6
14	.....	.55	1.8	2.6	.....	29	.7	1.4	.....	.....	2.55
15	.....	.6	1.8	2.35	.....	30	.65	1.8	.....	.....	2.8
						31	.9	.....	1.6	.....	2.05

BAKER LAKE NEAR CONCRETE, WASH.

This station, which is located at the fish hatchery on Baker Lake 17½ miles above Concrete, was established October 2, 1910, and is maintained in cooperation with the United States Bureau of Fisheries.

The gage is a vertical staff in two sections. The lake is not under artificial control, but the drainage area above is characterized by high, precipitous, barren, rocky slopes, the streams are flashy, and at times the lake rises very rapidly. On leaving the lake, Baker River flows in a deep and sluggish channel through a heavily timbered bottom. Ice frequently forms on the lake during the winter months.

The gage readings are furnished by the Bureau of Fisheries.

Daily gage height, in feet, of Baker Lake near Concrete, Wash., for 1910.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	1.95	2.1	11	3.9	7.5	2.3	21	2.75	11.1	1.9
2	3.95	2.2	2.6	12	3.15	4.7	2.15	22	2.45	6.6	1.8
3	6.7	2.3	3.1	13	2.8	3.7	2.0	23	2.3	4.9	2.1
4	5.2	2.45	3.0	14	2.6	3.2	1.8	24	4.8	3.8	3.95
5	4.4	2.2	2.8	15	2.5	2.7	1.7	25	9.0	3.2	3.1
6	7.7	2.8	2.9	16	2.7	2.4	1.7	26	4.7	2.75	2.8
7	7.8	7.25	3.1	17	3.5	2.3	1.8	27	3.65	2.4	2.5
8	4.9	6.5	3.05	18	5.2	2.1	1.7	28	2.9	2.2	2.2
9	6.5	5.2	2.9	19	3.95	3.5	1.65	29	2.4	2.0	2.0
10	5.15	9.1	2.6	20	3.2	3.6	1.75	30	2.3	2.0	2.0
								31	2.0	.....	1.9

BAKER RIVER BELOW ANDERSON CREEK, NEAR CONCRETE, WASH.

This station, which is located on the trail to Baker Lake, 11 miles above Concrete and one-fourth mile above the Baker River ranger station, 100 feet below Anderson Creek, in SE. ¼ sec. 30, T. 37 N., R. 9 E., was established September 1, 1910, in cooperation with the United States Forest Service.

Sulphur Creek enters 2 miles below and Anderson Creek 5 miles below.

The gage is an inclined staff spiked to an alder tree on the left bank. The original gage was installed at the trail bridge in the basalt canyon one-eighth mile above Anderson Creek. The second gage was installed at the present site below Anderson Creek and the relation between the two was established by a series of simultaneous readings. This gage was carried away by flood in November, 1910. It was replaced December 9 at the same site but at a datum 4.1 feet lower than originally. All gage readings have been reduced to the present gage and datum.

The channel shifts to some extent during floods, but on the whole results are fairly good.

Measurements are made from a cable and car near the gage.

Discharge measurements of Baker River below Anderson Creek, near Concrete, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 23	H. P. Gilkey	138	335	3.15	1,210
Nov. 6	do	140	643	4.77	2,850
Dec. 9	do	138	667	5.00	2,490
Dec. 26	do	140	589	4.55	1,920

Daily gage height, in feet, of Baker River below Anderson Creek, near Concrete, Wash., for 1910.

[Oliver Coleman, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept	Oct.	Nov.	Dec.
1		4.6	3.2		16	3.3	4.0	3.3	3.9
2		4.3	3.9		17	3.4	5.7	3.2	3.9
3		6.0	3.7		18	3.5	4.6	3.1	3.8
4		4.7	3.4		19	3.8	3.3	3.2	3.9
5		4.7	3.4		20	4.0	3.6		3.9
6		10.0	4.8		21	4.0			3.8
7		5.3	6.4		22	3.8	3.2		4.2
8		5.7	5.2		23	3.5	3.15		4.5
9		5.4	4.5	4.8	24	3.3	5.6		4.5
10	3.1	4.7	7.5	4.4	25	3.2	7.7		4.6
11	3.1	4.3	5.7	4.1	26	3.2	4.0		4.6
12	3.1	3.8	5.0	3.9	27	3.2	3.2		
13	3.2	4.0		3.8	28	3.3	3.1		
14	3.1	3.8	3.8	3.8	29	3.7	3.4		
15	3.1	3.5	3.6	3.9	30	3.3	3.1		
					31		3.1		

BAKER RIVER AT CONCRETE, WASH.

This station, which is located at the county bridge in Concrete, was established September 9, 1910, in cooperation with the Washington Portland Cement Co. It is below all tributaries. The drainage area is 295 square miles.

The records possess especial interest as representing the run-off from an area in which precipitation is perhaps as high as in any part of the United States.

A ditch for carrying shingle bolts diverts water at a point 100 feet above the bridge. The water in this ditch is measured as well as that in the main stream.

The gage is an inclined staff and is spiked to a fir root on the left bank 50 feet below the bridge; its datum has remained unchanged. The level of the river at this point is only about 13 feet above the normal level of the Skagit at the mouth of Baker River, so that when the Skagit is in extreme flood the gage heights may be affected by backwater from the lower stream. Thus far no indication of such an effect has been detected.

Discharge measurements are made from the lower side of the highway bridge.

The shifting of the channel during the flood of November, 1910, may have been caused by the washing out of the deposit of mud and clay which had been sluiced into the river. Several measurements have been obtained to cover the changes in channel and the records are good.

Discharge measurements of Baker River at Concrete, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 11	H. P. Gilkey	184	502	3.45	850
Oct. 3	Kimble and Gilkey	195	1,380	7.98	9,380
Nov. 7	H. P. Gilkey	199	1,350	7.87	12,000
Dec. 7	do	183	804	4.98	4,040
7	do	184	801	4.89	3,940
24	do	188	793	4.94	3,930

Daily gage height, in feet, of Baker River at Concrete, Wash., for 1910.

[Chas. Olsen, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	5.8	4.1	3.9	16	3.8	4.3	3.8	3.8
2	.....	5.3	4.4	4.9	17	4.0	4.35	3.7	3.6
3	.....	7.75	4.3	4.6	18	3.9	5.3	3.8	3.5
4	.....	6.0	4.1	4.4	19	4.1	4.7	3.8	3.5
5	.....	5.7	4.0	4.7	20	4.4	4.4	7.0	3.65
6	.....	8.65	5.3	4.9	21	4.4	4.2	9.65	3.6
7	.....	6.75	7.65	4.9	22	4.4	4.0	6.2	3.5
8	.....	6.2	6.0	4.85	23	4.2	4.0	5.6	5.2
9	.....	6.2	5.1	4.55	24	3.9	5.9	4.9	4.9
10	.....	5.4	9.05	4.2	25	3.8	7.8	4.5	4.7
11	3.45	4.8	6.8	4.0	26	3.7	5.4	4.2	4.4
12	3.45	4.2	5.2	3.85	27	3.6	4.6	4.0	4.1
13	3.5	4.3	4.6	3.75	28	3.7	4.3	3.8	3.9
14	3.55	4.2	4.3	3.6	29	4.7	4.1	3.7	3.8
15	3.7	4.4	4.0	3.55	30	4.0	4.0	4.1	4.0
					31	.....	3.8	.....	3.8

WHATCOM CREEK BASIN.

GENERAL FEATURES.

Whatcom Creek drains an area of 73 square miles surrounding Lake Whatcom and flows from the lake westward 2 miles into Bellingham Bay, an arm of Puget Sound. This area is composed of low foothills, whose peaks range in altitude from 1,000 to 3,000 feet above sea level. The soil is black loam in the bottoms and glacial gravel on the benches and slopes. This area was formerly heavily timbered, but most of the lower slopes have been cut over. The underbrush is kept back by repeatedly burning the cut-over area and is consequently sparse and confined to hardwood, brush, and quick-growing alder.

During the winter months this area is covered with a thin coating of snow to an average depth perhaps of 1 to 2 feet. Ice seldom forms. The stream might possibly be utilized by a small power plant, but it is chiefly valuable for the water supply it furnishes to the city of Bellingham. This affords the one example in the Puget Sound region of an area low relief drained by a stream unfed by glaciers. It is, therefore, an interesting exception to the general conditions prevalent to the streams of Puget Sound, as described on pages 590–591.

WHATCOM CREEK NEAR BELLINGHAM, WASH.

This station which is located at the Northern Pacific Railway siding bridge opposite Larson's station on the Bellingham Electric Railway, about one-fourth mile below the outlet of Lake Whatcom, in the NE. ¼ sec. 28, T. 38 N., R. 3 E., was established November 1, 1910, and is maintained in cooperation with the city engineer of Bellingham. There are no tributaries of any importance below the station, and the records show practically the total flow of the creek as well as the outflow of the lake.

The city diverts water from the lake for water supply, but the amount has not been determined.

The gage is a vertical staff; its datum has remained unchanged.

The level of the lake is now controlled by a dam at the outlet, but the outflow was practically natural during 1910. The records are believed to be fully reliable. The channel is sand and hardpan and is probably permanent.

Measurements are made from a gaging bridge on the upstream side of the railroad bridge.

Conditions for making measurements are good.

Large quantities of logs and shingle bolts are stored in the lake near the outlet, but they in nowise affect the flow at the station.

Discharge measurements of Whatcom Creek near Bellingham, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Nov. 1[a]	H. P. Gilkey	65	166	3.56	92.9
Dec. 2	do	85	299	4.68	375
2	do	85	297	4.67	375
18	do	85	290	4.58	327
20	do	81	277	4.5	306

[a] Measurement poor, not made at regular section.

Daily gage height, in feet, and discharge, in second-feet, of Whatcom Creek near Bellingham, Wash., for 1910.

[H. A. Whitney, observer.]

Day.	November.		December.		Day.	November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1	3.6	107	4.7	376	16	4.6	342	4.7	376
2	3.55	100	4.65	359	17	4.55	326	4.6	342
3	3.6	107	4.65	359	18	4.5	310	4.65	359
4	3.6	107	4.6	342	19	4.55	326	4.55	326
5	3.8	141	4.6	342	20	4.7	376	4.5	310
6	3.95	172	4.7	376	21	5.0	493	4.45	295
7	4.15	216	4.8	412	22	5.2	583	4.4	280
8	4.2	227	4.95	472	23	5.25	608	4.5	310
9	4.3	252	5.0	493	24	5.25	608	4.8	412
10	4.45	295	5.0	493	25	5.2	583	4.85	432
11	4.5	310	4.95	472	26	5.1	537	4.9	451
12	.....	268	4.9	451	27	5.0	493	5.0	493
13	4.2	227	4.85	432	28	4.9	451	5.0	493
14	4.9	451	4.85	432	29	4.85	432	5.0	493
15	4.85	432	4.7	376	30	4.7	376	5.1	537
					31	.....	.....	5.0	493

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Whatcom Creek near Bellingham, Wash., for 1910.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
November	608	100	342	20,400	A.
December	537	280	406	25,000	A.

NOOKSACK RIVER BASIN.

GENERAL FEATURES.

Nooksack River, which drains the western half of Whatcom County, Wash., rises on the western slopes of Mounts Baker and Shuksan. Its North Fork flows from the summit of Mount Shuksan westerly 25 miles to Maple Falls, Wash., where it turns and flows southwestward 13 miles to Deming, receiving in this stretch the Middle and South forks, which enter, respectively, 3 and 10 miles

below Maple Falls and 42 and 35 miles above the mouth of the stream. At Deming, 3 miles below the mouth of the South Fork, the river turns and flows northwesterly 16 miles to Lynden, where it again turns to the southwest. It enters Bellingham Bay from the north 6 miles above the city of Bellingham and 16 miles below Lynden, making a distance of about 70 miles by river from its mouth to the summit of Mount Shuksan, its most distant source.

The area comprises 825 square miles, of which approximately 300 square miles is within the Washington National Forest, and may be considered as wholly located on the high slopes of Mounts Baker and Shuksan. It will be noted, therefore, that although the Nooksack drains no part of the Cascade divide, it has large fields of ice and snow from which to draw permanent supplies of water. The topography of the area within the Washington National Forest is unusually rugged and angular. The mountain slopes and the grades of the stream courses are steep, especially on the Middle Fork, which almost literally drops from the summit of Mount Baker, 10 miles to the mouth of its canyon, 11 miles above Deming, and 8 miles above its confluence with the North Fork.

The most important tributary of the Nooksack for power utilization is the North Fork, which drains the largest area of the high levels, offers feasible power sites in the canyon at Glacier and storage sites above, and is probably the most uniform in flow. The Middle Fork, because of its extremely high grade, is a very flashy stream, on which a great daily fluctuation of stage may be expected. The South Fork is larger than the Middle Fork, but drains a lower area and is therefore not so well provided with a permanent water supply. The foregoing statements are based on a study of the map (Land Office map of Washington) and a brief examination of the region.

In forestation, topography, geology, and soil this area is no exception to the general region about Puget Sound (pp. 590–591). Possible power sites are numerous and of varying degrees of feasibility.

The Nooksack River system drains the extreme northwestern basin of the Pacific Northwest. It is therefore much less important than most of the Puget Sound streams, as it is farthest removed from future demands for power.

NORTH FORK OF NOOKSACK RIVER NEAR GLACIER, WASH.

This station, which is located at the Bellingham Bay & British Columbia Railroad bridge, 3 miles below the depot at Glacier, Wash., was established September 7, 1910, in cooperation with the United States Forest Service.

The station is below Glacier Creek and above Cowsap River.

The gage is an inclined staff attached to the bridge pier. It has been read only when the forest ranger passed the station in his regular work.

Measurements are made from the upstream side of the railroad bridge, which is 50 feet above the water.

The channel is of coarse gravel and is liable to shift at high water.

A good rating curve has been constructed and applied to such gage records as are available.

Discharge measurements of North Fork of Nooksack River near Glacier, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 7	H. P. Gilkey	92	207	1.85	609
Nov. 2	do	99	296	2.75	1,260
Dec. 3	do	104	343	3.08	1,530
19	do	101	236	2.26	663

Daily gage height, in feet, and discharge, in second-feet, of North Fork of Nooksack River near Glacier, Wash., for 1910.

[J. L. Jones, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.9	1,370				
2					2.75	1,250		
3							3.1	1,260
4								
5			3.0	1,450				
6								
7	1.85	625						
8								
9								
10	1.6	485						
11								
12			2.7	1,210				
13								
14	1.7	540	2.7	1,210				
15					2.5	1,050		
16								
17	2.1	780						
18					2.5	1,050		
19			2.9	1,370			2.25	670
20	2.8	1,290						
21					5.8	4,040		
22								
23	2.1	780						
24								
25			4.8	3,080				
26					2.3	910		
27								
28			2.5	1,050				
29	2.3	910						
30								
31								

NOTE.—These discharges are based on a fairly well-defined rating curve.

NOOKSACK RIVER NEAR DEMING, WASH.

This station, which is located at Nugent's bridge, 4 miles below Deming, Wash., was established September 6, 1910. It was originally located at the ferry at Pinkey's shingle mill, opposite the Northern Pacific Railway station at Deming, and was removed to the present site December 5, 1910, as the river had gradually worked into another channel until it left the gage dry.

The original station was 1½ miles below the junction of North and South forks. Anderson Creek is the only important stream entering between Deming and Nugent's bridge, and there are no streams of any magnitude below the lower station.

The gage is an inclined staff spiked to the wing dam on the left bank 10 feet above the bridge. Readings at this point were suspended March 31, 1911, on account of the unfavorable conditions and the poor results that were being obtained.

No water is diverted from the river.

Discharge measurements were made from a car and cable at the original section and from the upper side of Nugent's bridge after December 5. The lower section is very unsatisfactory.

The records are very poor, chiefly because of the shifting channel, but they serve to give a general idea of the behavior of the stream.

Discharge measurements of Nooksack River near Deming, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Sept. 8	H. P. Gilkey	309	581	3.9	1,100
Oct. 10	Kimble and Gilkey	320	995	5.42	4,680
Nov. 3	H. P. Gilkey	375	1,050	4.73	3,540
4	do	375	976	4.52	3,000
Dec. 22[a]	do	184	508	4.36	2,800

[a] Measurement and gage reading at Nugent's bridge.

Daily gage height, in feet, of Nooksack River near Deming, Wash., for 1910.

[Jerry Daniels, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		5.4	4.2		16	4.2	4.8	3.6	4.85
2		4.8	4.6		17	4.2	7.4	3.4	4.8
3		7.9	4.7		18	3.8	5.6	3.4	4.6
4		5.8	4.5		19	4.0	5.2	3.2	4.55
5		5.4	4.6	6.0	20	3.7	4.9	5.8	4.6
6	3.9	6.5	6.0	6.55	21	4.6	5.0	8.6	4.45
7	4.0	5.6	7.7	6.35	22	4.2	4.7	3.9	4.3
8	3.8	6.8	5.5	6.2	23	3.7	4.2	3.4	6.35
9	3.8	6.0	5.0	5.75	24	3.8	9.2	3.2	6.7
10	3.7	5.2	9.2	5.6	25	3.7	6.4		5.7
11	3.6	4.8	6.2	5.5	26	3.6	5.8		5.3
12	3.7	4.7	4.6	5.05	27	3.8	4.7		5.1
13	3.6	4.6	4.0	4.85	28	4.0	4.4		5.85
14	3.9	4.6	3.8	4.7	29	4.5	4.2		4.75
15	4.0	4.8	3.6	4.6	30	4.3	4.0		4.7
					31		4.3		4.7

NOTE.—Gage heights Sept. 6 to Nov. 24 read at the original station at Deming. After about Nov. 4 gage heights do not indicate the total discharge, as most of the water was carried in a slough past the gage. Gage readings made at Nugent's bridge after Dec. 5.

MIDDLE FORK OF NOOKSACK RIVER AT RANGER STATION NEAR DEMING, WASH.

This station, which is located in the SW. ¼ sec. 30, T. 38 N., R. 7 E., one-eighth mile above Deming ranger station and 19 miles above Deming, Wash., was established September 10, 1910, in cooperation with the United States Forest Service. The station lies at an elevation of 1,500 feet, and the drainage area reaches to the summit of Mount Baker.

The gage is spiked to a cedar beside the Mazama trail.

Measurements are made by wading at a point opposite the ranger station.

The channel is shifting and, as only one measurement was made, the daily discharge can not be computed.

The following measurement was made by H. P. Gilkey:

October 11, 1910: Width, 43 feet; area, 54 square feet; gage height, 2.30 feet; discharge, 212 second-feet.

Daily gage height, in feet, of Middle Fork of Nooksack River at ranger station near Deming, Wash., for 1910.

[Carl E. Bell, observer.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	2.6	2.2	3.9	16	.....	2.55	3.3	3.4
2	.....	3.3	2.5	4.0	17	.....	3.9	3.3	.....
3	.....	3.2	2.1	3.9	18	.....	2.6	3.3	.....
4	2.3	2.8	1.9	4.2	19	.....	2.4	3.8	.....
5	1.3	2.55	2.7	3.9	20	.....	2.3	5.3	.....
6	1.9	4.8	2.4	3.9	21	2.9	2.25	4.6	.....
7	2.0	2.8	3.9	3.85	22	2.8	1.9	4.0	.....
8	1.9	3.2	2.7	3.8	23	2.65	1.8	4.0	.....
9	1.8	2.8	2.3	3.7	24	2.5	4.2	3.7	.....
10	1.6	2.4	4.7	3.55	25	2.6	2.8	3.6	.....
11	.....	2.2	3.9	3.5	26	2.2	2.3	3.55	.....
12	.....	2.2	3.7	3.5	27	1.5	2.1	3.5	.....
13	.....	2.0	3.5	3.5	28	1.9	2.1	3.5	.....
14	.....	2.0	3.1	3.45	29	3.15	1.95	3.5	.....
15	.....	2.65	2.8	3.45	30	1.8	1.8	3.8	.....
					31	.....	2.0	.....	.....

MIDDLE FORK OF NOOKSACK RIVER NEAR DEMING, WASH.

This station, which is located at the county highway bridge at the mouth of the canyon, 8 miles above Deming and 3 miles above the junction of the North and Middle forks of Nooksack River, was established October 10, 1910. It is above all important tributaries of Middle Fork.

The gage, a vertical staff, was carried away by the flood of October 24, 1910, and was reestablished November 5, 1910, 50 feet below the bridge and set to read the same as the original gage would have read.

Discharge measurements are made from the bridge.

The river bed is of coarse gravel, which shifts during floods, which occur at almost any time on this stream. The records are only approximate because of the shifting channel.

Discharge measurements of Middle Fork of Nooksack River near Deming, Wash., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 11	H. P. Gilkey	65	121	2.05	593
Nov. 4	do	72	113	2.13	381
Dec. 23	do	76	245	3.15	1,840

Daily gage height, in feet, of Middle Fork of Nooksack River near Deming, Wash., for 1910.

[Turner Riddle, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1			2.0	11	2.0	2.45	1.8	21	1.8	3.65	1.6
2			2.45	12	1.95	2.2	1.7	22	1.8	2.6	1.65
3			2.15	13	1.85		1.7	23		2.7	3.45
4				14	1.9	1.9	1.6	24	6.4	2.25	2.3
5		2.0	2.55	15	1.95	1.8	1.6	25	3.75	2.05	
6			2.6	16	2.0	1.65	1.85	26		1.9	1.85
7		3.75	2.35	17	3.0	1.6	1.7	27		1.7	1.9
8		2.25	2.45	18	2.2	1.65		28		1.55	1.85
9		2.35	2.05	19	1.95	1.8	1.6	29			1.7
10		3.5	1.85	20	1.85		1.6	30			1.8
								31			1.7

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements have been made on streams in the north Pacific coast drainage basins during 1910. They are arranged in the same order of drainage basins as the regular stations.

Miscellaneous measurements in Pacific coast drainage basins in Oregon for 1910.

Rogue River basin.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Aug. 24	Rogue River	Pacific Ocean	Payton Bridge, Oreg.	(a)	1,090
20	Trail Creek	Rogue River	Trail, Oreg.		(b)
17	Lake Fork of Ashland Creek.	do	Above Ashland city intake		3
17	do	do	Below Ashland city intake		c 1
Dec. 2	Little Fork of Applegate Creek.	do	Ruch, Oreg.	(d)	55.4

a Water surface 11.65 feet below bolt head in stream face second timber from upstream side.
b Dry.
c Estimated.
d Water surface 4.7 feet below staple in forked tree on right bank, 300 feet above bridge.

Miscellaneous measurements in Pacific coast drainage basins in Oregon for 1910—Contd.

Umpqua River basin.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Sept. 9	North Fork of South Fork, Umpqua River	South Fork of Umpqua River.	Tiller, Oreg	1.50	14.6
Nov. 10	do	do	do	2.63	141
Sept. 9	Bear Creek, South Fork of South Fork.	do	do		14.2
6	Little River (South Fork of North Fork, Umpqua River).	North Fork of Umpqua River.	Peel, Oreg	1.77	7.8
Nov. 4	do	do	do	1.88	11

Miscellaneous measurements in Columbia River drainage basin for 1910.

Clark Fork basin.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Sept. 21	Rock Creek	Bitterroot River	Near Como, Mont	2.70	16.5
Oct. 18	Lolo Creek	do	Near Lolo, Mont	2.21	90
May 26	Ashley Creek	Mission Creek	Near St. Ignatius, Mont		31
June 21	do	do	do		20
Apr. 18	North Fork of Post Creek.	Post Creek	Near Ronan, Mont		4.7
Oct. 4	do	do	do		2.2
Apr. 19	Spring Creek	Jocko River	Near Arlee, Mont		12
May 29	do	do	do		12
June 22	do	do	do		12
Aug. 20	do	do	do		16
Oct. 6	do	do	do		14
June 23	Schley Creek	Finley Creek	Near Jocko, Mont	.50	4.5

Spokane River basin.

Aug. 12	St. Joe River	Cœur d'Alene Lake.	Old Remington post office near Calder, Idaho.	2.23	496
Nov. 20	do	do	Near Avery, Idaho	[a] 3.08	744

[a] Gage established Nov. 20. Regular gage readings begin Jan. 1, 1911.

Wenatchee River basin.

Apr. 6	Mission Creek	Wenatchee River	Cashmere, Wash		113
May 20	do	do	do		[a] 75
Nov. 26	do	do	do		[a] 15
28	Beaver Creek	do	Leavenworth, Wash		3.6

[a] Estimated.

Yakima River basin.

Aug 18	Yakima River	Columbia River	Below Cabin Creek		43.8
19	do	do	Ford near Nelson's	[a] 0.00	335
19	do	do	do	[a] .00	328
31	do	do	do	[a] .26	514
Sept. 16	do	do	do	[a] — .02	297
Aug. 20	do	do	3 miles above Thorp	[b] —3.54	1080
Sept. 1	do	do	do	[b] —4.01	716
17	do	do	do		396
Aug. 20	do	do	Bridge 2 miles above Ellensburg.	[c] —1.33	893
Sept. 1	do	do	do		567
17	do	do	do		309

[a] Reference point is on log on right bank at section.
[b] Reference point is top of lower steel sheet in left downstream caisson.
[c] Reference point is lower joint in left downstream caisson.

Miscellaneous measurements in Columbia River drainage basin for 1910—Continued.

Yakima River basin—Continued.

Date.	Stream.	Tributary to—	Locality.	Gage hight.	Discharge.
				Feet.	*Sec.-ft.*
Aug. 21	Yakima River	Columbia River	Thrall		918
Sept. 2	do	do	do		582
18	do	do	do		354
Aug. 22	do	do	Pomona Gap, near Selah		882
Sept. 3	do	do	do	a .00 b—.12	661
19	do	do	do	a—.22 b—.32	440
Aug. 22	do	do	Selah Gap, near North Yakima.	c—4.31	945
Sept. 3	do	do	do	c—4.81	599
19	do	do	do		430
20	do	do	Union Gap, near Yakima		792
Aug. 10	do	do	Rockyford, near Mabton		323
Sept. 8	Eight small creeks	Lake Keechelus		(d)	4.3
8	Boulder Creek	do	East shore	(d)	1.9
8	Gold Creek	do	do	(d)	11.4
8	Roaring Creek	do	West shore	(d)	26.4
8	Meadow Creek	do	do	(d)	3.2
Aug. 18	Small creeks	Yakima River	Between Cabin Creek and Lake Keechelus.	(e)	9.2
30	do	do	do	(e)	5.0
Sept. 15	do	do	do	(e)	d 4.7
July 15	Cabin Creek	do	Mouth, near Easton	1.27	16.8
Sept. 15	Kachess River	do	do		2.1
8, 9	19 small creeks	Kachess Lake	East shore	(d)	7.0
9	10 small creeks	do	do	(d)	3.9
9	Box Canyon Creek	do	do	(d)	5.4
15	Silver Creek	Yakima River	Near Easton	(d)	.9
15	Tucker Creek	do	do	(e)	d .4
July 26	Big Creek	do	Near Clealum	.37	d 19.1
Aug. 30	do	do	do	.26	11.0
Sept. 15	do	do	do	d .21	9.5
July 26	Little Creek	do	Below diversions, near Clealum.		Dry.
Aug. 13	Small streams	do	Between Nelson's and Clealum.	(e)	6.8
Sept. 16	do	do	do	(e)	d 3.0
10	Clealum River	Clealum Lake	Big Salmon La Sac, near Roslyn.	(d)	95.6
10	Middle Fork of Clealum River.	Clealum River	Above Big Salmon La Sac mouth, near Roslyn.	(d)	d 50.5
10	West Fork of Clealum River.	do	Between Big Salmon La Sac, near Roslyn.	(d)	40.0
10	Six small creeks	Clealum Lake	East shore	(e)	d .7
Aug. 19	Roslyn Creek	Yakima River	Mouth, at Clealum	(e)	d 1.0
Sept. 16	do	do	do	(e)	d 1.0
Aug. 21	Taneum Creek	do	Mouth, near Thorp	(e)	.5
Sept. 2	Wilson Creek	do	Near Thrall	f—.76	131
18	do	do	do	f—.93	94
18	Umtanum Creek	do	Umtanum	(e)	d .25
May 5	Wenas Creek	do	Wenas, Wash	2.09	48.5
Aug. 22	do	do	Mouth, near Selah	(e)	2
Sept 30	Gold Creek	Naches River	Mouth, above Nile	(d)	.75
30	Rock Creek	do	do	(d)	1.4
June 16	Nile Creek	do	do	(e)	10
16	Rattlesnake Creek	do	Mouth, near Nile		482
Sept. 30	do	do	do	(d)	27
June 15	Wildcat Creek	Tieton River	Mouth	(e)	45
July 8	Wide Hollow waste	Yakima River	Yakima		32.3
Aug. 24	do	do	do		27.5
Sept. 6	do	do	do		31.3
20	do	do	do		32.4
5	Moxee returns	do	Moxee Valley	(e)	4.5
19	do	do	do	(e)	7.0
July 8	Nasty Creek	Atanum Creek	Tampico, Wash	(e)	.5
May 20	Dry Creek	Satus Creek	Toppenish-Goldendale road	(e)	10

a Below pointed shoulder of lava bowlder, 50 feet below section
b Reference point is scratch in downstream face of bowlder.
c Reference point is 8-penny nail on stream face cottonwood, left bank, 1½ feet above bridge.
d Low water.
e Estimated.
f Reference point on bridge.

Miscellaneous measurements in Columbia River drainage basin for 1910—Continued.

Miscellaneous canal measurements in Yakima River basin.

Date.	Canal	Diverts from—	Locality.	Discharge.
				Sec.-ft.
Aug. 20	Cascade [a]	Yakima River	Flume 3 miles above Thorp, Wash., below spill No. 1.	88.8
Sept. 1	do	do	do	84.3
17	do	do	do	82.7
May 13	Ellison Brutton [b]	do	Intake 2 miles above Thorp, Wash	4.73
Aug. 5	do	do	do	5
Sept. 1	Small ditch, name unknown.	do	Highway bridge 2 miles from North Ellensburg, Wash.	8.3
May 12	Bull [c]	do	Flume at slaughterhouse, 1 mile below Ellensburg.	45.3
June 9	do	do	do	37.7
23	do	do	do	26.6
Aug. 4	do	do	do	32.6
Sept. 1	do [d]	do	Near intake at highway bridge 2 miles from North Ellensburg, Wash.	43.4
17	do	do	do	35
May 12	Fogarty	do	Intake 1 mile below Ellensburg, Wash.	18.8
June 23	do	do	do	16.6
Aug. 4	do	do	do	4.88
22	Selah-Moxee [a]	do	Intake 1 mile above Pomona, Wash	90.8
22	Gilson power	do	do	75.4
22	do	do	Power house, Pomona	22.0
22	Taylor	do	Flume at intake	25.5
Sept. 3	do	do	do	16.0
Apr. 24	Granger	do	At Moxee hop ranch, near North Yakima.	6.07
May 21	do	do	do	8.3
June 20	do	do	do	6.04
July 18	do	do	do	6.88
Aug. 15	do	do	do	11.5
Sept. 12	do	do	do	.5
June 22	Union Gap Irrigation Co. [e]	do	Flume at Union Gap at end of Fowler canal near Wapato, Wash.	25.0
Sept. 9 [f]	Snipes-Allen	do	do	15.0
Aug. 15	Hatch	do	Near Toppenish, Wash	6.8
15	Gilbert	do	do	16.6
Sept. 8 [f]	do	do	Flume at power house, Prosser, Wash.	14.9
Aug. 3	Prosser Power Co. [g]	do	do	338
2	Amon	do	Intake	30
May 27	Z. H. Benton [h]	Naches River	Intake 20 miles above Naches	2.5
Aug. 9	do	do	do	6.4
May 27	Carmack & Heigh	do	Intake 14½ miles above Naches	2
Aug. 9	do	do	do	4
May 27	Markel & Andrews	do	Intake 18½ miles above Naches	3
Aug. 9	do	do	do	8.22
May 27	Hunting, Freeland Frederick.	do	Intake 14 miles above Naches	2
Aug. 9	do	do	do	7
May 27	H. A. Griffin	do	Intake 13 miles above Naches	2
Aug. 9	do	do	do	2
May 27	Scott Stevens	do	Intake 12 miles above Naches	1.5
Aug. 9	do	do	do	2
May 27	W. F. Meloy	do	Intake 11 miles above Naches	1.5
Aug. 9	do	do	do	4
May 20	Clarke	do	Intake 2 miles above Naches	14.1
July 11	do	do	do	11.2
Aug. 10	do	do	do	8.18
Sept. 9	John Cox	do	do	1.72
20	Basket Ford	do	Intake 6 miles below Naches	3.27
20	McCormack & Long	do	Intake 8 miles below Naches	6.31
20	Chapman & Nelson	do	Intake 5 miles above North Yakima	16.9
20	Sculler & Rodenbach [h]	do	Intake 4 miles above North Yakima	5.44
Aug. 9	Lindsay & Markel	Nile Creek	18 miles above Naches	4
9	Williams & Abel	Big Rattlesnake Creek.	16 miles above Naches	6.94
9	Beck	Rattlesnake Creek	Intake 15½ miles above Naches	3

[a] There is a spillway between this point and regular station.
[b] This canal carried water intermittently during season, being dry most of the time.
[c] At point of delivery for irrigation.
[d] At intake amount diverted from river.
[e] This canal is an extension of the Fowler.
[f] 1909.
[g] Total flow of Yakima River.
[h] Two ditches.

Miscellaneous measurements in Columbia River drainage basin for 1910—Continued.

Snake River basin.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Mar. 27	Fall Creek	Snake River	Above ditches, near Neeley, Idaho.		32.3
30	Warm Creek	do	Near mouth, near Neeley, Idaho		5.2
28	Rock Creek	do	Bridge near mouth, near Neeley, Idaho.		57.1
28	Raft River	do	Near Yale, Idaho		238
28	Lower Hall canal	Diverts from Raft River.	Rice's ranch, near Yale, Idaho		18.6
11	Dry Creek	Snake River	¼ mile above ditch intakes, 9 miles from Murtaugh, Idaho.	2.60	28.2
Apr. 9	do	do	do	2.65	25.7
Mar. 18	Big Wood River	do	Below Magic dam, near Richfield, Idaho.	7.42	1,300
Feb. 5[a]	North Fork of Pine Creek.	Pine Creek	Near Pine, Oreg		60
Jan. 30	Goldburg Creek	Pahsimeroi River	At temporary gage above regular station, Goldburg, Idaho.	2.65	1.4
Apr. 15	do	do	do	2.65	2.0
Nov. 1	Timber Creek	Lemhi River	1 mile above Basin Creek, near Leadore, Idaho.		17.3
Sept. 14	Minam River	Wallowa River	Minam, Oreg		67
13	Silver Lake canal	Diverts from Wallowa River.	Joseph, Oreg		11.5
13	Farmer's canal	do	do		16
13	Flour mill canal	do	do		21.4
14	Dobbins's canal	do	do	0.93	21.4

[a] Furnished through courtesy of C. C. Cottrell, Baker City, Oreg.

Deschutes River basin.

Apr. 27	Deschutes River	Columbia River	West's ranch, near Lava. Oreg.	9.87	2,160
July 9	Stearns's ditch	Diverts from Deschutes River.	Prineville, Oreg	.63	10

Willamette River basin.

Aug. 8	Callapooya Creek	Willamette River	Shedd, Oreg	(b)	28
Aug. 3	Rickreal River	do	Dallas	(d)	.3
Oct. 6	Big Fork of Fall Creek	Middle Fork Willamette River.	Fall Creek, Oreg	(a)	97
10	Lost Creek	McKenzies River	McKinzie Bridge	(b)	201
Aug. 8	Horse Creek	do	do		285
Oct. 11	do	do	do	c—15.0	319
Dec. 18	do	do	do	c—14.65	526
Aug. 8	Mohawk Creek	do	do	(b)	36
Oct. 7	Otter Creek	North Fork Santiam River.	Detroit, Oreg		2.5
7	Whiskey Creek	do	do	(d)	7
8	Whitewater Creek	do	do	3.00	41.8
8	Parmelia Creek	do	do	4.50	80.9
10	Tumble Creek	do	do	(d)	3
Aug. 3	Canyon Creek	South Fork Santiam River.	Cascadia		13.2
Oct. 13	Mill race	Santiam River	Jefferson	(e)	55.4

[a] 25 feet below 20d. nail in upstream side of bridge and marked "Reference point, United States Geological Survey."
[b] Low water.
[c] Below reference point at 65-foot mark on downstream side girder.
[d] Estimated.
[e] 4.1 feet below brass tack in center downstream post of bridge at mill.

Miscellaneous measurements in Puget Sound and Pacific Ocean drainage basins in Washington.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Aug. 23	Skykomish River	Puget Sound	Skykomish	[a]—.40	[b] 453
Sept. 15	Quinault River	Pacific Ocean	Above Lake Quinault	(b)	381
22	Hamma Hamma River	Hood Canal		(b)	77
Nov. 26	Nisqually River	Puget Sound	Elbe, Wash		1,980
Dec. 21	Skookum Creek	South Fork Nooksack River.	Deming, Wash	2.70	86

[a] Below nail in upper left-hand bridge crib. [b] Exceptionally low water.

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